OURNAL OF THE AMERICAN TATISTICAL ASSOCIATION

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The American Statistical Association is a scientific and educational organization. Its membership is not confined to professional statisticians but includes economists, business executives, research directors, government officials, university professors, and other persons who are seriously interested in the application of statistical methods to practical problems, in the development of more useful methods, and in the improvement of basic statistical data. Engineers, mathematicians, biologists, actuaries, sociologists, psychologists, and representatives of many other professions are included in the membership of the Association. Information about the Association and membership application forms may be secured from the Secretary, Frederick F. Stephan, 722 Woodward Building, Washington, D. C.

The One-hundredth Annual Meeting of the American Statistical Association will be held in Detroit, Michigan, December 27 to 30, 1938. With a few exceptions the sessions are open to the public.

Chapters of the Association have been organized in important cities in the United States. Information concerning the meetings of these chapters may be secured from the District Representatives listed on another page.

The Editors welcome the submission of articles and notes for possible publication in the JOURNAL. Manuscripts should be sent to the Editor, Journal of the American Statistical Association, 722 Woodward Building, Washington, D. C. Books for review should be sent to the Review Editor, Ralph J. Watkins, Bureau of Business Research, University of Pittsburgh, Pittsburgh, Pennsylvania. Authors who wish suggestions about the preparation of manuscripts and charts or information about editorial policies should address their inquiries to the Editor.

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JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION

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THE MISUSE OF STATISTICS

By Jerome B. Cohen
College of the City of New York

> The safety of science depends on the existence of men who care more for the justice of their methods than for the value of any results obtained by using them.[1]

While we have come a long way in the past twenty years in the collection and availability of statistical data and in the minute refinement of statistical methodology, we have been noticeably backward in detecting and publicizing statistical misuses. Though instances of such misuse occur more frequently today, doubtless because of the far greater employment of statistical data in contemporary debate and discussion and due to the fortunately growing tendency of basing economic speculation on a statistical and factual foundation, nevertheless a survey of the literature of the past reveals its quota of cases. The Classical economists made little use of statistics. Adam Smith spoke disparagingly of what he termed "Political Arithmetic,"[2] declaring bluntly "I have no great faith in political arithmetic . . . "[3] Dugald Stewart, with equal skepticism declared,

> . . . instead of appealing to political arithmetic as a check on the conclusions of political economy, it would often be more reasonable to have recourse to political economy as a check on the extravagancies of political arithmetic.[4]

This mistrust may be attributed to two circumstances; the statistical data available at the time were fragmentary and unreliable. Smith himself takes note of an instance of poor coverage and inadequacy in the statement:

> A great part of the extraordinary work, besides, which is probably done in cheap years, never enters the public registers of manufactures. The men servants who leave their masters become independent laborers. The women return to their parents, and commonly spin in order to make cloaths for themselves and their families. Even the independent workmen do not

[1] Cohen, Morris R., on "Scientific Method," in *The Encyclopedia of the Social Sciences.*

[2] "By Political Arithmetick, we mean the Art of Reasoning, by Figures, upon Things relating to Government." Sir Charles Davenant's definition in *Discourses on the Public Revenues, and on the Trade of England* (London, 1698), Part I, p. 2; see also Stephen Bauer's "History of Political Arithmetic," in *Palgrave's Dictionary of Political Economy.*"

[3] Smith, Adam, *Wealth of Nations*, Book IV, Chapter V, Cannan-Modern Library Edition, p. 501.

[4] Stewart, Dugald, "Elements of the Philosophy of the Human Mind," Part II, Chapter IV, Section 5, in *Collected Works* III, pp. 331–2.

> always work for public sale, but are employed by some of their neighbors in manufactures for family use. The produce of their labor, therefore, frequently makes no figure in those public registers of which the records are sometimes published with so much parade, and from which our merchants and manufacturers would often vainly pretend to announce the prosperity or declension of the greatest empires.[5]

Secondly, this inadequacy of data gave rise to a number of celebrated controversies, in which the leading participants came to diametrically opposite conclusions, thereby discrediting their procedure and bringing their methodology into disrepute. A famous pamphleteer, Richard Price, attempted to show that the population of England had declined by slightly less than 30 per cent in the century after the Revolution of 1688. He compared estimates based on the hearth-money tax collected at the beginning of the period with estimates based on the inhabited house receipts at the end of the period. The data were not comparable and hence his surprising result. Someone else, using parish registers, concluded on the other hand that there had been a steady increase in the population over the period.

Ricardo's controversy with Bosanquet served to strengthen the faith in theory and weaken the case for statistics. Bosanquet had attacked the conclusions of the Bullion Committee upon which Ricardo had served. Though admitting the theoretical logic of the Committee's contentions, Bosanquet advanced statistical tables on foreign exchange between Hamburg, Paris, and London to disprove them. Ricardo, with his complete knowledge of exchange rates derived from a lifetime of business experience, was able to demonstrate numerous sources of error which rendered the tables invalid and with some feeling declared:

> . . . For any man to compare the account of the Hamburgh exchange, and of the Parisian and not to see that the accounts were incorrect, that the facts could not be as so stated, is very much like a man who is all for the facts and nothing for theory. Such men can hardly ever sift their facts. They are credulous, and necessarily so, because they have no standard of reference. These two sets of supposed facts, those in the Hamburgh exchange on the one hand, and those in the Parisian on the other, are absolutely inconsistent and disprove one another. That facts such as these should be brought forward to invalidate a theory, the reasonableness of which is allowed, is a melancholy proof of the power of prejudice over very enlightened minds.[6]

Instances might be multiplied.[7] The principles to be drawn therefrom would not be changed. Theorists long harboured a justifiable mistrust of statistics, because of the early inadequacy of available data, because

[5] Smith, op. cit. p. 85.

[6] Ricardo, David, "Reply to Mr. Bosanquet's Practical Observations on the Report of the Bullion Committee," in *Economic Essays of David Ricardo*, edited by E. C. K. Gonner (London, 1923) p. 82.

[7] See Knies, Karl, *Die Statistik als selbständige Wissenschaft* (Kassel, 1850). An account of Bodin's controversy with his contemporary Malestroit over the trend of prices may be found in *Les Six Livres de la Republique* (Paris, 1576) Book 6.

of a permanent inability to prove or disprove certain types of theory (a theory of value, for example) by resort to statistics,[8] and later because of the apparent success of maintaining both sides of a controversy by the introduction of different collections of statistical data. It is precisely this last factor which has been so greatly responsible for the popularization of statistical technique in this country during the past quarter century. Well might General Francis A. Walker declare, "The American people are intensely and passionately devoted to statistics" and Professor North add some years later "Popular interest has grown since."[9]

It has become an accepted American pastime in politico-economic controversies to attempt to "prove" and "disprove" by means of statistical data. As a consequence an alarming number of instances of the misuse, misinterpretation, and perversion of statistics by partisans is apparent to one whose eye is focused for such observation. Errors frequently escape us because we do not look for them. If we really search for them we should find that they are much more numerous than we suspect. A pro-New Deal evening newspaper carried the following column headline and lead on its financial page:

ELECTRIC OUTPUT IN SEASONAL RISE

Electric power production for the week ended May 28 rose substantially above the total of the previous week . . .[10]

The next morning an anti-New Deal paper carried the following dispatch:

POWER OUTPUT OFF 10.6 % FROM 1937 FIGURES

The production of electricity in the United States in the week ended May 28 was 1,973,000,000 kilowatt hours, a drop of 10.6 per cent from the 1937 week according to the Edison Electric Institute.[11]

The probability is that this apparent contradiction involving misuse escaped general detection. While to the trained statistician the fallacy involved is obvious, how puzzled and confused must have been the average layman who had the misfortune to stumble across both dispatches. Had he read only the *Post* item how misled he would have been.

The author has over the past few years been investigating instances of the misuse of statistics. Much has been done. A great deal more, along lines to be indicated, remains to be accomplished. The mass of

[8] See "Quantitative Analysis in Economic Theory" by W. C. Mitchell, Presidential Address before the American Economic Association, *American Economic Review*, March, 1925.

[9] North, S. N. D., "Seventy-Five Years of Progress in Statistics," in the *History of Statistics*, edited by John Koren (New York, 1918).

[10] *New York Post*, June 2, 1938.

[11] *New York Herald Tribune*, June 3, 1938.

cases which has been collected appears on the one hand to call for classification; on the other to defy it. A preliminary attempt reveals that errors are to be found in every phase of statistical method and every field of statistical data. A classification along functional lines of methodology would treat of errors involved in index number construction, use of averages, correlation, etc. A topical classification on the basis of fields of data would consider errors in wealth and income statistics, price statistics, foreign trade statistics, etc.

Obviously the two types of classification would overlap. Within one topical group such as labor statistics there are to be found errors of various functional types. The topical type classification, when fully developed, will be of most use to workers specializing in a particular field. The functional type classification will interest statisticians concerned with methodology. In the discussion which follows, in which cases will be cited to illustrate the various types of error, it is to be noted that we are concerned with, as the title of this article clearly states, the misuse of statistics; with attempts to select and arrange data in such a way that desired, and therefore unjustifiable conclusions may be drawn, and with instances where incorrect inferences are drawn from valid data. The trained statistician absorbed in the improvement of technical procedure grows careless in interpretation, or, more usually, leaves the presentation and popularization of his data to statistical amateurs on whom the word "caution" exerts no restraining influence.

The results of statistical investigations are usually stated in numerical form and are therefore, in the public mind, assigned a degree of definiteness usually associated with mathematical technique. The careful investigator, however, is constantly aware of the fact that the preciseness of his numerical result varies directly with the degree of care used in selecting, from the larger universe, the sample upon which his study is based. The numerical conclusions derived from a study of the sample are held to be characteristic and representative of the universe. A very common error in statistical investigation is the selection of a sample which is not an accurate cross-section of the larger universe but merely a particular, unique segment. Conclusions drawn from the biased sample will not, of course, accurately reflect the larger universe. The misuse occurs when such conclusions are held to be representative of the universe by those who either deliberately or unconsciously overlook the sampling bias.

The nature of erroneous sampling and the damage wrought by conclusions drawn from it was most vividly and dramatically impressed

upon the public mind in the *Literary Digest* poll fiasco at the time of the 1936 Presidential election. Over ten million ballots were mailed out by the *Digest* and it was expected that the very large size of the sample would overcome the lack of scientific selection. Unfortunately for the *Digest*, however, the mailing list was drawn from telephone books and lists of automobile owners. A definite bias in favor of high income, anti-New Deal opinion was introduced and reflected in the poll's conclusion that Governor Landon would win. The American Institute of Public Opinion sent out 275,000 ballots. The magazine, *Fortune*, interviewed 3,000 persons. The small size of both samples was more than compensated for by the very careful selection and inclusion of all economic groups in the population. The much greater accuracy of the Institute and *Fortune* polls demonstrated that where great care is taken in the selection of a representative sample, size becomes less important.

A check of samples by census tracts in a study of the size of families in a certain area revealed that the samples had indicated larger households than were actually true of the district. The difference was not due to faulty selection so far as nativity, race stock, and economic status were concerned. It was then discovered that the enumerators failed to revisit all families not at home when they called. Obviously the larger the family the greater the likelihood of someone being home when the enumerator called. Childless, married women were more likely to have been at work or engaged in social routine away from home.[12]

The pitfalls of sampling are presumably eliminated by a census which covers the entire population. Often, however, even in the case of a census complete accuracy is more imagined than real. In China, one census, taken for poll-tax and military purposes, returned a population of 28,000,000. A few years later when the same statistics were gathered over the same territory, this time for famine relief, the population increased to 105,000,000. Women, between the ages of 18 and 25, are notoriously more numerous in the census than in real life. Negroes in the South live to amazing old ages in statistical investigations. With poor birth records and the widely prevalent tendency for old people to overstate their ages, how much reliance can be placed on records indicating great life span for members of a race whose death rate is very high?

Where the census is taken periodically and the spirit of scientific

[12] Kiser, Clyde V., "Pitfalls in Sampling for Population Study," in this JOURNAL, Vol. XXIX, p. 251.

progress prevails, it is natural that methods of enumeration and coverage should be improved. This improvement, which has taken place in the United States,[13] leads to erroneous conclusions in the interpretation of census data. Some years ago a feverish apprehension over the fear of Negro domination of the country seized many people and a good part of the press. On the face of the census returns Negroes had increased much more rapidly than whites between 1870 and 1880. Reputable statisticians hastened to point out that the census of 1870 had been particularly deficient in the enumeration of Negroes in the South and that the census of 1880 had been conducted on a much more efficient and scientific basis, but it was difficult to stem the tide of propaganda.[14] Erroneous comparisons of this type, due here to improving coverage, may likewise arise because of changing classification or definition.

Difficulty may be evaded in comparisons, Professor Bowley warns,

> . . . so long as precisely the same definition and the same classification are preserved. It is usually indifferent on which side of a line relatively small marginal quantities are placed; the rate of change is hardly effected. More important is the consideration that while very varying estimates may be made by different investigators for one date the change shown over a period is definite if the method and classifications are the same throughout.[15]

There was an 8 per cent increase in the death rate from syphilis in New York State in 1937 as compared with 1936. Does this necessarily mean that there was an increase in syphilis or in mortality due to syphilis? In view of the widespread campaign during 1937 to publicize the nature and causes of syphilis and popularize remedial treatment, one doubts that the disease is increasing. Rather the apparent increase in mortality due to syphilis may be attributed to the fact that doctors are no longer reluctant to ascribe death to syphilis on the death certificate. Formerly physicians were hesitant about stigmatizing the deceased and rather than attribute death to syphilis would give "heart disease" as the cause.

Articles contrasting full employment in Germany with mass unemployment here are completely misleading. It is impossible to compare the unemployment figures because the definition of an unemployed person in Germany differs widely from any definition used in this country. In Germany young people in the Labour Force are counted as employed. The Director of the Institut für Konjunktürforschung, Dr. Wagemann visited this country last year and was

[13] See Holt, W. Stull, *The Bureau of the Census—Its History, Activities and Organization* (The Brookings Institution, Washington, 1929); also Reed, V. D., "Comparability versus Change," in this JOURNAL, December 1937.

[14] Gannett, Henry, "Statistical Blunders," in *Forum*, 1901.

[15] Bowley, A. L., *Wages and Income in the United Kingdom Since 1860* (Cambridge, 1937), p. viii.

amazed to learn that our CCC boys and those engaged in public works construction are counted as unemployed.[16] All persons employed by the government in any capacity in Germany are counted as employed.

Prior to our entry into the World War, the *Navy Year-Book*, in keeping with the desires of the advocates of preparedness, juggled figures: counted obsolete or obsolescent vessels in listing the navies of Germany and other countries but omitted them in our case; counted certain German and other battleships, building or provided for, but omitted similar ones for the United States and thus made our Navy appear inferior.[17]

An excellent example of how one may supply data to support either side of a controversy by varying classification is found in the perennial dispute over the status of the middle class. One may prove, as one wishes, that the middle class is increasing or decreasing. It is largely a matter of classification, of defining what groups are to be included within that nebulous classification "middle class" and what groups are to be excluded.[18]

The study of marriage statistics in Japan presents difficulties because of changing classifications. Ryoichi Ishii in his very cautious and careful study[19] indicates that in Japan there are a considerable number of couples who are informally married. Regular religious or social ceremonies are performed but the unions are informal because they are not registered, which is a necessary requirement for the legal validity of a marriage in Japan. Many marriages because of certain legal complications are not registered. After the first census of 1920, however, the official attitude was relaxed and census authorities reported not only legal but also informal marriages. It is impossible, therefore, with any degree of statistical accuracy, to compare marriages in Japan in say 1890–1900 with marriages from 1920–1930.

Figures on the distribution of races in different countries and continents are in a chaotic, non-comparable, state and very misleading.[20] American agricultural statistics are inaccurate and misleading because of the Census Bureau's inconsistent definition of a farm, Professor Brandt claims.[21] It is improper to compare farm and non-farm incomes,

[16] Dr. Wagemann is the author of a volume entitled *Narrenspiegel der Statistik* which deals with the pitfalls of statistical investigation. [See p. 755. Ed.]

[17] See Arnett, Alex M., *Claude Kitchen and the Wilson War Policies* (Boston, 1937), p. 61.

[18] See Appendix A of *Insurgent America* by Alfred Bingham; also Corey, L., *The Decline of American Capitalism;* and Hansen, A. H., "Industrial Classes in the United States in 1920," in this JOURNAL, Vol. 17, p. 417 and Vol. 18, p. 503.

[19] Ishii, Ryoichi, *Population Pressure and Economic Life in Japan* (London, 1937), pp. 92–3.

[20] See Kuczynski, Robert, *Population Movements* (Oxford, 1936), pp. 81–6.

[21] See Brandt, K., "Fallacious Census Terminology and Its Consequences in Agriculture," in *Social Research*, February, 1938; also Black, J. D. and Allen, R. H., "The Counting of Farms in the United States," in this JOURNAL, September, 1937.

as is so often done, Professor Morgan feels, because the statistics on farm income are consistent underestimates.[22]

John A. Hobson holds that the parade of working class savings periodically presented in the British press only conceals a growing maladjustment by its failure to produce for comparison the rates of saving among the non-working class and by attributing to the former all Post Office savings which he demonstrates are largely deposited by non-workers.[23]

A bewildering and contradictory barrage of unemployment estimates has been loosed on the American public in recent years. Thus for the month of November 1935 the following estimates of the number of unemployed were made:

The National Industrial Conference Board	9,177,000
Government Committee on Economic Security (September 1935)	10,915,000
The American Federation of Labor	11,672,187
National Research League	14,175,000
Labor Research Association	17,029,000

Six months later the United States Chamber of Commerce estimated the number of unemployed at 4,000,000 and the *New York Sun* announced that on the basis of a survey of 30,000,000 workers unemployment amounted to between, 3,000,000 and 3,500,000. The Labor Research Association insisted that all estimates lower than its own were erroneous. The Chamber of Commerce held that all estimates higher than its figures were inaccurate.[24] William Green attacked the *Sun's* estimate and the *Sun* in equally uncomplimentary fashion analyzed the Federation's figures.[25] Statisticians were amused, the public bewildered. The obvious cause of the difficulty was a matter of classification and definition. The Labor Research Association's estimate included unemployment among farm labor. Other estimates did not consider farm labor.[26] Allowances for persons leaving school, seeking work but never having had a position before, varied. The higher estimates of unemployed included a one million correction of the United States Census of April, 1930. Despite the mass of reputable statistical opinion in favor of this correction, those responsible for the lower estimates made no such allowance. Unemployment among professionals was not considered in the lower estimates. The subject need not be

[22] Morgan, O. S., "Farmers Aren't So Poor," in *Independent Journal of Columbia University*, March 18, 1938.

[23] Hobson, J. A., *Confessions of an Economic Heretic* (London, 1938), pp. 183–4.

[24] Report of the Special Committee on Employment headed by John W. O'Leary presented to the Chamber, November 20, 1936, p. 3.

[25] For the exchange of letters see *The New York Sun*, June 5, 1936.

[26] "Methods of Estimating Unemployment," Report of the Labor Research Association, June 1936.

pursued further.[27] Varying coverage, differences of classification and unlike definitions render data non-comparable, confusing, and where comparison is insisted upon, misleading.[28]

Errors of comparison may arise because of the neglect of population change, changing price levels and other miscellaneous factors. Shortly after the World War there was an outcry against the high rate of taxation. Figures on tax collections were cited to show that taxes in 1920 represented a 320 per cent increase over those of 1913. As Shultz indicates, no account was taken of the sharp rise in prices over the period 1913–20. If we deflate the tax figures by eliminating the element of inflated prices and consider the tax burden, as it logically should be considered, in terms of purchasing power taken away from the taxpayer, we find that the tremendous tax collections of 1920 represented an increase, not of 320 per cent, but of 90 per cent over those of 1913. If the increase in population be taken into account as well, it would be found that per capita taxes rose less rapidly than collections stated either in actual or in "constant purchasing power" dollars.[29] The comparison of the relative tax burdens of countries or cities is frequently misleading in that no account is taken of the facilities and services furnished for the taxes paid. The citizen of the low tax community may be forced to forego such services and facilities or else purchase them privately at a greater price than if they had been placed on a communal basis and paid for by taxes.

In the spring of this year, when sentiment in the business community was low, the *New York Post* in an editorial designed to promote optimism cited statistics on retail sales to prove that conditions were really better than people imagined. Figures showed retail sales in April of 1938 to be higher than sales in April, 1937. The editorial neglected to mention, however, that the Easter holiday in 1937 fell at the end of March and that Easter shopping was therefore concentrated in the middle two weeks of March, whereas in 1938 Easter occurred in the

[27] Close attention has been given in recent years to unemployment figures: see Hogg, M. H., "Sources of Incomparability and Error in Employment and Unemployment Surveys, in this JOURNAL, September, 1930; Nathan, R. R., "Estimates of Unemployment in the United States, 1929–35," in the *International Labour Review*, January, 1936; Humphrey, D. D., "Some Adjustments in Census Data on Unemployment," in this JOURNAL, December, 1937; Kreps, T. J., "Estimates of Unemployment During the Last Four Years," in this JOURNAL, March, 1934 *Supplement;* also "An Attempt to Construct International Measures of Unemployment, in *International Labour Review*, October, 1932 and "Some Problems in the Construction of Index Numbers of Employment," in the *International Labour Review*, April, 1934 and "Some Recent Censuses or Estimates of Unemployment," in the *International Labour Review*, July, 1933.

[28] For an interesting discussion of the difficulties involved in definition and the dependence of accurate statistics on precise definition see "Methods Used in Strike Statistics" by Florence Peterson in this JOURNAL, March, 1937.

[29] Shultz, W. J., "American Public Finance and Taxation" (New York, 1938), Chapter 14.

middle of April, resulting, therefore, in a concentration of Easter shopping in the first two weeks in April.

James J. Davis in a speech entitled "Every Six Minutes a Man is Killed" made the following astounding statement:

> Many an American youth believed that his life was to be cut off prematurely when the government called him to the colors in 1917 to fight for his country. The fact was that he was really in less danger while fighting for the land that bore him than he was while engaged in his peaceful vocations. Fifty-three thousand-three hundred American soldiers were killed or died of wounds during the nineteen months of our participation in the War, victims of every refinement of modern slaughter; yet during that same period 132,000 persons were killed at home in the performance of the tasks of peace.[30]

Had Mr. Davis compared the percentage of deaths to the total exposed to death in the trenches to the percentage of deaths of the total exposed to death at home, he would probably have been somewhat chagrined at the result.

A similar instance of the use of absolute numbers where percentages should be used is found in the numerous attempts to disprove the Marxian thesis of the disappearance of the middle class by showing the growth in the actual number of small commercial establishments over several decades.

The opposite error of using percentages when the citation of exact figures would be more revealing occurs quite frequently. Professor Chaddock cites the classic example. A short time after Johns Hopkins University had opened certain courses in the University to women, it was reported that 33⅓ per cent of the women had married into the faculty. Investigation revealed that only three women had attended the courses.[31]

Very often a percentage is calculated incorrectly[32] or an incorrect base is used and a valueless relationship is offered for public consumption. New York Stock Exchange figures on short interests are stated as a per cent of the total shares of a company. The importance of short interest, however, lies in relation to normal volume of shares traded in on the Exchange. Stated in the first way the percentages indicating short interest customarily range from one-quarter of one per cent to two and a half per cent. Stated in the second way they customarily range from 30 to 200 per cent. There is an obvious reason for using the first method.[33]

[30] *New York Herald Tribune*, January 2, 1927.

[31] Chaddock, R., *Principles and Methods of Statistics* (New York, 1925), pp. 13–4.

[32] For numerous examples of this see Croxton, F. E. and Cowden, D. J., *Practical Business Statistics* (New York, 1937), Chapter 7.

[33] *The New York Times*, August 9, 1938

An average is a measure of central tendency. Where there is no central tendency the use of an average is completely misleading in that it conceals divergent trends. Professor Spahr points out that the index number of prices (a type of average) in Sweden has been remarkably stable to the delight of the advocates of a managed currency. This apparent stability, however, up to the time at which he wrote had been due to the combination of rising prices of imported goods with the falling prices of agricultural products grown at home.[34]

An average is likewise a summary picture of a total situation. Frequently, however, we are more interested in the parts than we are in the whole, and a summary picture is misleading. *The Guaranty Survey* goes to great statistical lengths to prove that the railroads as a whole are not overcapitalized. The figures presented in proof are, of course, average figures.[35] But, as Professor Edwards declares, in the case of certain specific roads there has been and is overcapitalization.[36] And we are concerned with specific roads. One-third of the railroad mileage of the country is in bankruptcy. Because the solvent two-thirds balances the bankrupt one-third on the average, we are asked to disregard the one-third and assume that what is true on the average is true of the whole and its parts.

In his recent study advocating economic nationalism, Jerome Frank attempts to show the unimportance of our foreign trade by pointing to the fact that our exports, for decades have never exceeded 7 per cent of our annual production of goods and services. The percentage is so small therefore that we may easily readjust ourselves to eliminate it. Now this figure is a type of average and as such it conceals much. Although at no time have we exported more than 7 per cent of our total goods and services we quite normally export approximately half of our cotton crop, 35 per cent of our tobacco crop, 25 per cent of our wheat, etc. The loss of our foreign markets would involve considerable readjustment in certain specific industries, a readjustment of which the 7 per cent Frank cites gives little indication.[37]

Finally it may be shown that averages under certain circumstances may indicate a trend that is not at all true of the tendency of the components. Thus Kuczynski cites an instance where the average wage of a group as a whole may increase while the wage of each individual worker decreases.[38] He assumes that a factory employs 1,000 workers

[34] Spahr, W. E., *The Monetary Theories of Warren and Pearson* (Farrar and Rinehart), Pamphlet No. 1, p. 15.

[35] "Railroad Finances and Business Recovery," *The Guaranty Survey*, January 31, 1938, p. 3.

[36] Edwards, G. W., *Evolution of Finance Capitalism* (New York, 1938), Chapter 15.

[37] Frank J., *Save America First* (New York, 1938).

[38] Kuczynski, Jurgen, *Labour Conditions in Western Europe* (London, 1937), p. 16.

of whom 200 are key men and receive a wage of 50 shillings a week while the remaining 800 receive 20*s* per week. The average wage is thus 26*s* per worker. During a crisis the 200 key men are retained but 600 of the remaining workers are laid off. Wages for all workers are cut 20 per cent thus giving the 200 key men 40*s* per week and the 200 ordinary workers 16*s* per week. The average wage is now 28*s*. While this is undoubtedly an exceptional case it may well serve as a warning of the distortion to which averages are subject.

The bias introduced in an index number by faulty weighting or by non-weighting has seldom been used to mislead. The danger is considered at length in every elementary text and statisticians have been quick to point out and others to correct violations.[39] The arbitrary selection of whatever base period is most suitable to the purpose at hand has, however, become a commonly recurring and widely used method of distortion of late. Where absolute numbers are employed it becomes a matter of selecting the most advantageous period on which to base the comparison and the misuse involved resembles types previously described.

The American Federation of Labor throughout 1935 and 1936 pointed to the greater recovery in the index of production compared to the index of employment; to the sharper gain in profits than in wages, using as its base period in both instances either the previous year or the low point of the depression. The *New York Times* in an editorial lashed out against "these misleading comparisons and the false conclusions and false remedies based upon them." By using depression lows obviously, indices would show production rising more than employment and profits more than wages because during the depression production and profits had fallen much more than employment and wages. Using 1929 as the base year (Federal Reserve Board indices) production in 1932 was 53 per cent of that of 1929; employment 61 per cent. By February, 1936 the *Times* indicated, both indices stood at 79, thereby demonstrating the misleading nature of the American Federation of Labor's statistics. Factory payrolls in 1932 fell to 42 per cent of 1929 but corporation net income fell from $8,100,000 to minus $5,400,000,000. Therefore profits could rise much faster than wages and still be below wages as compared with pre-depression levels.

The United States Steel Corporation is a case in point. In 1935 the net

[39] See Fisher, Irving, *The Making of Index Numbers* (New York, 1927), and Mitchell, W. C., "The Making and Using of Index Numbers," Bulletin No. 656 (Reprint of Part I of Bulletin No. 284) U. S. Department of Labor, Bureau of Labor Statistics. The whole concept of index numbers has been questioned in *Horses and Apples* by Bassett Jones. See also "Some Basic Problems in Index Number Theory," by E. E. Lewis, in *Economic Essays in Honor of W. C. Mitchell.*

> income of the corporation was about $1,000,000, while payrolls were $252,000,000. In 1929 the net income of the Corporation was $198,000,000, and payrolls were $420,000,000. So if by some miracle the company's net income and payrolls were now both to return to 1929 figures, the A. F. of L.'s statisticians would be able to point out that payrolls had risen only 66 per cent above those of 1935, while profits had increased 19,700 per cent.[40]

Throughout the 1936 Presidential campaign New Deal orators uniformly pointed to economic progress under the Roosevelt Administration by comparing 1936 figures and indices with January or March 1933 data.[41]

Mr. Hoover protested against this practice.

> Incidentally, the culmination of that era of great fear is the convenient starting point for all of the President's comparative statistics. He chooses the low point of quotation induced by their own actions. If he would go back a few months in 1932, before the great fear started, he would find that prices were 80 to 100 per cent higher than those he quotes. And they were in 100 cent dollars.[42]

But the Democrats had no monopoly of this practice. The Republican National Committee widely circulated the information that "Food Costs Jump 40% in 3 Years." The increase in the cost of living under the New Deal was thoroughly publicized and the figures used by the Republican were July 14, 1936 retail prices compared with March 15, 1933 figures. The Democrats protested against this misuse. A headline in the *New York Post* for October 16, 1936 read,

> REPUBLICAN BLAST AT COST OF LIVING IS PROVED A DUD—PANIC FIGURES ARE USED AGAINST F.D.R.

Republicans were asked if they wished to return to the 1933 panic price level since they were using this as their base period. Democrats pointed out that although wholesale prices had risen since 1933 they were only 80 per cent of the 1926 level. All in all it was a weird demonstration of mutual hypocrisy.

Germany index numbers of wholesale prices and cost-of-living, are inaccurate. Wholesale prices have remained remarkably stable, in view of the trend in other countries and the cost-of-living index has risen only slightly, according to the official figures. The League of Nations Statistical Office accepts and reproduces the official index figures without any qualification.[43] Prices used in the computation of index numbers are the official figures fixed by the Price Commissioner. They are

[40] *The New York Times*, May 20, 1936.

[41] For an excellent example of this practice see table entitled "Last Three Years of the Old Deal Compared with First Three Years of the New Deal" in *Philadelphia Record*, January 21, 1936.

[42] Hoover, H., "The Agricultural Policies of the New Deal" speech at Lincoln, Nebraska, January 16, 1936.

[43] *Money and Banking, 1937/38*, League of Nations, Commerical and Central Banks (Geneva, 1938), Vol. II, p. 90.

maximum prices but the German press itself admits that they are generally exceeded. They are prices for goods of a quality which has become increasingly difficult to obtain. The shortage of foodstuffs and consumption goods forces the consumer to resort to more expensive qualities. The prices of the more expensive classes of goods, however, are not used at all in the computation of the official index numbers. In addition the cost-of-living index is unrepresentative because it is based on an inadequate and outmoded budget.

The American Commercial Attache sums up succinctly:

> Little, if any, attention need be paid to the German statistics of the cost of living since the official index has long ago ceased to reflect the actual movement of retail prices and of its other component parts.[44]

The interpretation of conclusions derived from the application of correlation technique almost inevitably leads the novice in the field of statistics into error and furnishes a fertile area for manipulation by partisans. Although in every field of statistical technique a detailed knowledge of the whole situation is essential for the avoidance of error, it is particularly necessary in the realm of correlation analysis because of the unfortunately widespread tendency to read unjustified conclusions into a coefficient of correlation.

High correlation may be due to pure chance or to purely mathematical qualities. Correlation is often held to establish a cause and effect relationship when as a matter of fact correlation demonstrates nothing but the existence of a relationship. Error in the use of correlation technique, therefore, arises when correlation, due to either chance or mathematical elements of the data, is held to be significant, or where the existence of high correlation is interpreted as evidence of a causal relationship.

Where there is no common-sense relationship whatsoever, correlation due to pure chance is usually recognized as such. Dr. George Marshall in an unpublished study at The Brookings Institution[45] correlated variations in the death rate of the State of Hyderabad from 1911 to 1919 with variations in the membership of the International Association of Machinists from 1912 to 1920 and obtained the very high positive correlation of .86. Obviously no one would attach any importance to the correlation. Certainly no one would assume a cause and effect relationship had been demonstrated.

[44] Miller, Douglas, *Annual Economic Review, Germany 1937*, U. S. Department of Commerce, p. 101; see also *Germany's Economic Situation at the Turn of 1937/38*, Reichs-Kredit-Gesellschaft (Berlin), p. 50; and, *Economic Conditions in Germany to March 1938* by E. C. D. Rawlins, Department of Overseas Trade, Great Britain, pp. 230–1.

[45] Cohen, M. R., "Reason and Nature" (New York, 1931) p. 92.

Where a relationship, however, is within the realm of logical possibility and where for the purposes at hand the demonstration of a causal connection is desired, a positive correlation will unfortunately probably be so interpreted. English statistics reveal three trends: the proportion of marriages contracted outside the Church of England has been increasing for many years; the average age of Britons at death has also been increasing and the divorce rate has been rising. Yule points out that there is a positive correlation between the increase in the proportion of marriages contracted outside the Church of England and the increase in the average age of death. Yet, he adds, no one supposes that there is a causal relationship and that a law prohibiting the solemnization of marriages in churches would have the effect of improving the longevity of the nation.[46] However, a Church of England publication points to the correlation between the increase in the proportion of marriages contracted outside the Church and the growth in the divorce rate and holds the former to be the cause of the latter. If this correlation were considered alone the assumption of the causal relationship might appear logical to many but is it any more logical than the assumption that because there is a positive correlation between the growth in the divorce rate and the increase in the average age at death the increase in the average age at death may be attributed to the diminution of nervous strain and the increase of peace of mind resulting from the greater ease in eliminating a nagging spouse?

Spurious correlation, due to purely mathematical factors and to the arrangement of data, frequently arises when there is really no correlation or results in the exaggeration of a legitimate correlation. The technical details involved need not detain us here.[47]

Procedure involved in time series analysis rests on a firm foundation. Methodology is constantly being improved to iron out slight biases and imperfections. Forecasting, however, rests upon no such firm foundation and allows human frailties full play. While the statistical facts upon which the forecast is based may be perfectly accurate, the assumptions involved in the procedure are the weak element, even where they are considered and they are, more often than not, overlooked. The basic assumption is that what has been consistently true, or true on the average, in the past, will continue to occur, with measur-

[46] See Yule, G. U., *Theory of Statistics* (London, 1916) and Tippett, L. H. C., *Methods of Statistics* (London, 1937), p. 162.

[47] For an exposition of the mathematical nature of spurious correlation see Yule, op. cit. pp. 215–6; Elderton, W. P., *Frequency Curves and Correlation* (London, 1927), pp. 155–8; Crum, W. L. and Patton, A. C., *Economic Statistics* (New York, 1925), p. 257; and Ezekiel, M., *Methods of Correlation Analysis* (New York, 1930), pp. 319, 347. Instances of spurious correlation are found most frequently in education and psychology. See Garrett, H. E., *Statistics in Education and Psychology* (New York, 1926).

able limits of variation, in the future. In the early 1920's a statistically accurate population study forecast that the population of New York City would be 29,000,000 by the year 2000. As *The Nation*, with keen insight, remarked,

> . . . the estimate rests on the assurance that New York is going on for years at the same rate and in the same direction as now—in other words, that it is not going to learn anything during the remainder of the century.[48]

A forecast is nothing more than a conditioned guess and, where the forecast is represented as being practically fact, statistical technique is abused. A copper mining company, desirous of selling stock to a credulous public plotted its past five-year production on a semi-log chart, drew a line of trend and extended it three years, representing the figures for those three years as probable production. A publication, which had captured popular fancy, as many fads do, forecast its circulation for five years in the future on the basis of its first five years circulation and distributed the "facts" widely among prospective advertisers.

Secretary of State, Cordell Hull recently took up his pen in protest against what he termed an "amazing statistical performance." In a letter to John D. M. Hamilton he decried "the misleading use of trade statistics by the Republican National Committee."[49] The Republicans had circulated a pamphlet in the farm areas comparing farm exports and imports in 1932 and 1937. The figures for the latter year showed a large decrease in exports and a sharp increase in imports. This, it was stated, was the consequence of Secretary Hull's trade agreements program and it was more than implied that Secretary Hull did not have the farmer's welfare at heart. Hull replied that it was not the trade agreements program which was responsible for the changed trend of farm imports and exports but rather the 1936 drought. This, he held, had sharply reduced exports and had necessitated increased imports of farm produce.

The controversy is illustrative of a type of dispute that occurs quite frequently and gives rise to the charge of misleading use of statistics. The statistics are usually substantially accurate. Opinions differ as to causes responsible for the trend shown or as to conclusions that may be drawn therefrom. Another case in point is the recent controversy between Gardiner C. Means and Rufus S. Tucker. Utilizing charts showing that the most sensitive fourth of all the prices included in the Bureau of Labor Statistics index had fallen 65 per cent from 1929 to 1933, while the least sensitive fourth had fallen only 10 per cent, Means

[48] *The Nation*, November 7, 1923.

[49] For reprint of the full text of the letter see *New York Times*, September 4, 1938.

attempted to prove that "oligopolies" exercised such control over prices in some industries as to cause inflexibility and that one of the leading causes for the depression was the disparity which had developed between sensitive and insensitive prices.[50] Both men were in complete agreement as to the inflexibility of certain prices and the sensitivity of others. In fact Tucker showed that such a condition had existed in previous depression periods.[51] The issue was joined on what caused the inflexibility of certain prices, Means claiming that conditions of monopoly were responsible while Tucker held that other factors affecting supply and demand, such as the proportion of immediate out-of-pocket costs to the value of the product, controlled. The *New York Times* declared:

> Certain prices are more sensitive than others and have always been, and if a statistician wishes to show the course of insensitive prices by one line on a chart and the course of sensitive prices by another, there is no reason why he should not do so. But what his chart will prove when drawn is another question. Neither the statistician nor the readers of the chart have the right, for example, automatically to begin calling the insensitive prices "administered" prices. That is a point to be proved, not to be assumed.[52]

Occasionally incorrect inferences will be drawn from valid data because all the factors in a given situation are not known or because they have been deliberately overlooked. To a considerable extent the misuses of statistics involve logical fallacies of this type akin to fallacious arguments of a non-statistical type, glaring examples of which may be found in advertising and in political and religious tracts.

Propagandists on the West Coast during the hysteria of the early twenties attempted to prove that Japan had been violating the Gentlemen's Agreement. They cited statistics on the number of Japanese arrivals in the United States (92,606). They made no mention of the statistics of departure (80,432). They neglected to point out that the figures on arrivals included those for the Hawaiian Islands; included a large number of merchants, clerks and students sent here temporarily; included all Japanese going to Europe via the United States; and included Japanese who had been in America before and as "former residents" had returned from short visits to Japan.

Space does not permit an elaboration of the topical classification. Numerous studies are available on the statistics of particular fields[53]

[50] *Industrial Prices and Their Relative Inflexibility*, 74th Congress, 1st Session, Senate Document No. 13.

[51] "The Essential Historical Facts About 'Sensitive' and 'Administered' Prices," in *The Annalist*, February 4, 1938.

[52] *The New York Times*, February 11, 1938.

[53] For example see Mears, Eliot G., "The Foreign Trade Statistics of the United States," in this JOURNAL, September 1935, and also the interesting essays in *Statistics in Social Studies*, edited by S. A. Rice (Philadelphia, 1930).

but nothing of consequence has been noted on the misuse and misinterpretation of data in such fields. This is unfortunate because the detection of error, be it accidental or deliberate, is so much easier for one who is well versed in the technical detail of the universe from which the data is drawn and who is so thoroughly acquainted with the whole situation that a comprehension of all factors which may play a part is available without effort. Manifestly it is impossible for any one person to be expertly at home in all the diverse fields in which statistical technique is employed. Consequently a real elaboration along topical lines calls for cooperative effort on the part of specialists and the author would welcome suggestions toward this end.

How may the various types of errors described be avoided? A long list of rules might be presented but its value would be dubious. Those who deliberately set out to mislead and deceive will not be stopped by a few cautioning "don'ts." Those who are careless enough to accidentally misuse statistical technique are not likely to commit a long list of rules to memory. The continuous application of a large measure of common sense, caution and reasoning skepticism is by far the safest bulwark against error, for as Pearson once declared:

> It can scarcely be questioned that when the truth or falsehood of an event or observation may have important bearings on conduct, over-doubt is more socially valuable than over-credulity.[54]

Though statistics is no more likely to be discredited by misuse than medicine is by the activity of a few "quacks," the numerous attempts to mislead the public by manipulation must be regarded as an annoying reality. Legal and medical associations are alert to weed out malpractices and one may seriously consider whether statisticians as a group ought not to act similarly. The establishment of a committee of the Association for the purpose of informing members of instances where current attempts are being made to deceive and the devotion of a page or two in each issue of the JOURNAL to recording instances of error, might well be considered.

[54] Pearson, K., *Grammer of Science* (London, 1911), p. 54.

INTEREST AND DIVIDENDS IN THE BALANCE OF INTERNATIONAL PAYMENTS

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I

International payments of interest and dividends in 1929 were estimated at 11 per cent of the world international trade in merchandise.[1] In 1936 such payments were estimated at slightly over 12 per cent of the merchandise trade. While much smaller in dollar volume than the merchandise trade, interest and dividends are definitely second in size among the trade and service items in the balance of international payments.

An analysis of the data relating to the interest and divident account in balances of international payments is desirable for several reasons: first, because of the statistical importance of the account; second, because of the absence of any detailed analysis of its behavior; and third, because of the interest in its recent trends and the need for some well-founded conclusions thereon. In the course of the analysis the following questions should be answered: To what extent is the interest and dividend item controlled by the capital account? Do interest and dividend payments and receipts bear any close relation to any other item or items in the balance of payments? What are the characteristics of the payments and receipts as determined by the parts into which they may be divided? What is the relation of the conclusions thus drawn to the practical problems of today?

The following discussion is based primarily on an analysis of the data relating to the balance of international payments of Canada and the United States. These two countries provide us with balances of payments of two distinct types: first, the balance of payments of a debtor country, and second, one of a creditor country with an excess of merchandise exports. Some data are also used from the balance of payments of the United Kingdom, a creditor country with an excess of merchandise imports, while occasional use is made of data regarding other countries.

II

In the Canadian balance of international payments in 1936, interest and dividend receipts comprised 6.4 per cent of the total trade and service debit (payments) items, while the payments comprised 20.5

[1] League of Nations, *Balances of Payments*, 1936, p. 36.

per cent of the credit (receipts) items.[2] In 1929 the corresponding percentages were 3.1 and 18.2. The debtor position of Canada is clearly revealed by these figures. Furthermore, they emphasize the fact that interest and dividend payments by Canada did not decline nearly as much from 1929 to 1936 as did the other types of trade and service transactions. (See Table I.)

TABLE I

INTEREST AND DIVIDEND RECEIPTS AND PAYMENTS IN THE BALANCE OF INTERNATIONAL PAYMENTS OF CANADA AND THE UNITED STATES

Year	Receipts as a percentage of trade and service imports		Payments as a percentage of trade and service exports	
	Canada	United States	Canada	United States
1929.....	3.1	14.0	18.2	5.6
1930.....	3.6	17.7	25.3	5.1
1931.....	4.3	19.2	30.5	3.5
1932.....	4.3	19.2	33.7	2.7
1933.....	4.7	21.1	31.2	4.1
1934.....	5.8	19.4	25.8	4.2
1935.....	6.0	17.0	22.2	5.3
1936.....	6.4	15.4	20.5	6.7

Sources: Calculated from data given in Canada, Dominion Bureau of Statistics, *The Canadian Balance of International Payments, 1926–1936*, Ottawa, 1937, and in U. S. Department of Commerce, *The Balance of International Payments of the United States.*

nI the 1936 balance of international payments of the United States, interest and dividend receipts were equal to 15.4 per cent of all trade and service export (credit) items, while the payments were 6.7 per cent of the import (debit) items. The corresponding 1929 figures were 14.0 per cent and 5.6 per cent. These data reveal very definitely the net creditor position of the United States. Receipts of interest and dividends, while not conforming entirely to the trend of the other service items, revealed greater flexibility than the Canadian payments. The United States payments conformed to the general trend of the trade and service items to a high degree, if allowance is made for certain inaccuracies in the basic data (see footnote 4). These agreements and disagreements with the trend will be identified later in this article through a study of the relative size of the various types of investments from which the income is derived.

Available data regarding the balance of payments of the United Kingdom do not permit comparisons similar to those made relative to Canada and the United States. It will have to suffice to compare interest and dividend receipts with merchandise imports. In 1936 such receipts in the United Kingdom were 23.0 per cent of the imports, and in 1929, 20.8 per cent. Interest and dividend receipts in 1936 and 1929

[2] These comparisons of interest and dividend receipts with trade and service payments, and vice versa, were adopted on the theory that the volume of the latter provides the usual means for the transfer of the former. Gold is included among the Canadian trade and service items.

in the United States were, respectively, 23.4 and 22.3 per cent of imports and in Canada were 12.0 and 4.7 per cent. United Kingdom payments of interest and dividends in 1936 and 1929 were apparently insignificant, while in the United States they amounted, respectively, to 9.7 and 7.9 per cent and in Canada to 32.4 and 26.6 per cent of merchandise exports (excluding gold). The net creditor position of the United Kingdom is very evident from these figures.

These data should be sufficient to set in bold relief the different places which interest and dividend receipts and payments occupy in the balance of international payments of these countries. They also demonstrate further the statistical importance of the interest and dividend account.

III

In its long-term variations, the interest and dividend items are undoubtedly controlled very considerably by the capital movement. A country which is a net exporter of capital for new investment is building up a capital fund from which larger receipts may be expected. On the other hand, a country which year after year is importing foreign capital is building up a large debt and the yearly payments for the use of that capital may be expected to increase. The extent to which those larger receipts or payments materialize is, of course, affected by such factors as the long-term trends of money rates and the success or failure of the investments. The steady rise from 1865 to 1914 of payments by the United States on foreign investments and the steady rise of receipts from 1900 to 1929 bear out the long-term dependence of the interest and dividend item on the capital movement.

The short-term variations of interest and dividends do not seem to be closely connected with the capital account. Reference to the facts relating to several countries will demonstrate this statement. Table II shows the trend of investments and interest and dividends in Canada from 1928 to 1936, inclusive. Payments reached a low point in 1933, while foreign investments in Canada in that year were higher than at the beginning or the close of the period. Furthermore, although the two indices relating to investments in Canada and payments thereon corresponded in general trend through 1934, they did not correspond as to the extent of the change, and were exactly contrary in trend in 1935 and 1936. On the receipts side of the Canadian account, interest and dividends varied from 123.9 in 1928 (1926–1927 = 100) to 91.3 in 1933 and 178.5 in 1936—an 87.2 point range. Canadian investments abroad only had a 6 point range—111.1 in 1928, 109.5 in 1933 and 115.5 in 1936. As shown in Table II, the annual fluctuations of the receipts and the investments do not correspond closely.

TABLE II
TREND OF FOREIGN INVESTMENT TOTALS AND INTEREST AND DIVIDEND RECEIPTS AND PAYMENTS—CANADA
(1926–7 = 100)

Year	Foreign investments in Canada	Interest and dividend payments	Canadian investments abroad	Interest and dividend receipts
1928.....	107.6	110.2	111.1	123.9
1929.....	113.2	129.4	113.6	144.5
1930.....	119.2	140.0	115.3	139.3
1931.....	117.1	132.8	114.3	117.8
1932.....	115.2	121.2	110.8	92.3
1933.....	114.5	105.9	109.5	91.3
1934.....	115.4	107.4	112.0	129.7
1935.....	114.2	108.8	114.4	145.2
1936.....	113.2	124.7	115.5	178.5

Source: Calculated from data given in Canada, Dominion Bureau of Statistics, *The Canadian Balance of International Payments, 1926–1936*, and *British and Foreign Capital Invested in Canada and Canadian Capital Invested Abroad, 1926–1936.*

Data regarding the interest and dividend receipts and payments of the United States and the respective investments are not sufficiently comparable throughout the period from 1928 to 1937 to warrant the construction of an index. The trends of the capital movements and the interest and dividends are so diverse, however, as to warrant general conclusions from the data. In Table III, the first and third columns, it is seen that United States long- and short-term capital was exported during 1928, 1929 and 1930, while in Table IV it is noted that interest and dividend receipts (credits) from foreign investments increased in 1928 and 1929 but declined in 1930. Since the latter year there has been an inflow of both long- and short-term capital, with a minor exception in 1933, and, while receipts declined through 1932, they have risen rapidly ever since directly contrary to the capital trend.

TABLE III
CAPITAL MOVEMENTS IN THE BALANCE OF INTERNATIONAL PAYMENTS OF THE UNITED STATES, 1928–1937
(Millions of dollars)

	Long-term capital movement		Short-term capital movement	
Year	Affecting United States investments abroad	Affecting foreign investments in the United States	Affecting United States investments abroad	Affecting foreign investments in the United States
1928.....	1,185	526	111	−115
1929.....	511	374	178	191
1930.....	328	61	185	−300
1931.....	−166	53	−563	−1,272
1932.....	−273	−56	−186	−595
1933.....	48	137	29	−383
1934.....	−185	−13	−106	86
1935.....	−118	344	−365	606
1936.....	−177	596	− 94	310
1937.....	−271	251	− 54	236

Source: U. S. Department of Commerce, "The Balance of International Payments of the United States," various years.

Note: A minus sign (−) indicates a capital movement which tends to decrease the total investment in the category involved.

TABLE IV

INDICES OF CERTAIN ITEMS IN THE BALANCE OF INTERNATIONAL PAYMENTS OF THE UNITED STATES, 1928–1937

(1926–7 = 100)

Year	Merchandise trade		Tourist expenditures		Interest and dividends	
	Exports	Imports	Credits	Debits	Credits	Debits
1928.....	106.0	95.0	110.9	108.3	116.4	131.0
1929.....	108.4	102.2	124.5	124.4	127.6	151.1
1930.....	79.4	71.1	108.8	115.5	119.4	109.5
1931.....	50.1	48.5	76.2	86.1	86.3	46.0
1932.....	33.3	30.7	48.3	67.6	60.1	24.8
1933.....	34.6	33.7	48.3	44.2	63.5	37.6
1934.....	44.1	38.4	58.5	50.2	64.3	46.0
1935.....	47.2	47.5	79.6	62.0	67.9	62.4
1936.....	50.8	56.3	94.6	75.3	74.1	86.9
1937.....	69.2	71.6	106.1	90.0	79.3	101.5

Source: Calculated from data given in U. S. Department of Commerce, *The Balance of International Payments of the United States.*

Foreign long-term capital flowed into the United States almost continuously from 1928 to 1937 (Table III, columns II and IV), broken only by a small outflow in 1932 and 1934. Notwithstanding the large net inflow of capital, interest and dividend payments on the foreign long-term investments in the United States declined very sharply during the years from 1930 to 1932, inclusive. Of greater significance is the record of the three years, 1935–37, inclusive—during those three years $1,191,000,000 (net) of long-term foreign capital was invested in the United States or 27 per cent of the total investments at the end of 1934, while interest and dividend payments rose from $125,000,000 in 1934 to $277,000,000 in 1937, an increase of 121 per cent.

Short-term foreign capital left the United States in large quantities from 1928 to 1933, inclusive, and the income therefrom declined even more sharply as a result of the decline in short-term rates. From 1934 to 1937 such foreign short-term funds increased $1,238,000,000, but the income paid to foreigners remained at about $1,000,000 throughout the four years because those funds were largely demand deposits upon which, by law, no interest could be paid.

The British experience has been quite similar to that of the United States. According to Sir Robert Kindersley's estimates[3] British overseas investments amounted to £3,438,000,000 in 1929, £3,356,000,000 in 1932 and £3,414,000,000 in 1935—not a very decided change. The income from those investments, however, changed from £231,000,000 in 1929 to £156,000,000 in 1932 and £168,000,000 in 1935—fluctuations of considerable size compared with those of the investments. Still the fluctuations of income were relatively small compared with the experience of the United States because of the fact that Dominion issues comprise a larger part of the British investments than they do of those

[3] Quoted in the *Economist* (London), November 20, 1937, pp. 360 and 361.

of the United States, and the Dominion issues were not in default to any considerable extent.

By glancing back over these examples of the lack of correspondence between capital movements and interest and dividend receipts and payments, several important facts become apparent. In the Canadian example (Table II), payments declined during the depression and then increased, but neither the decline nor the subsequent increase compared in scope with those shown by Canadian interest and dividend receipts. The reason was, of course, that foreign investments in Canada were composed of a much larger proportion of bonds (fixed interest bearing securities) than were Canadian investments in foreign countries. Furthermore, Canada did not default to any considerable extent on its bonded indebtedness. The income from direct investments and investments in common stocks is subject to wider fluctuations than bond investments.

This fact is given emphasis by the experience of the United States. The decline in interest and dividend receipts in this country was made more noticeable than the decline in Canadian payments by reason of the large number of defaults on foreign dollar bonds held, and by the repatriation of large quantities of foreign bonds. Although the decline in interest receipts in the United States has been continuous since 1930, the greater profitability of, and income received from, direct investments has caused total interest and dividend receipts to increase substantially since 1933. United States payments to foreigners have been affected by two circumstances: first, a large part of the foreign capital in this country is invested in common and preferred stocks which have received greatly increased dividends since 1933; and, second, there was a large inflow of foreign capital into the United States during those same years. The result has been an increase in payments, since 1933, even more rapid than that shown by receipts.

Tables IV and V show clearly that the interest and dividend receipts and payments of the United States conform, in general to the pattern set by the other items. Some of the differences in trend may be accounted for by changes in methods of estimating the various items.[4] Through 1932 only one item departed widely from a common trend—interest and dividend payments (debits)—and that is explained above. In 1933, all of the items except tourist expenditures abroad (debits) turned slightly upwards. From 1933 on, interest and dividend receipts (credits) lagged, as a result of continued defaults on foreign bond hold-

[4] For example, beginning in 1934 the estimates of interest and dividends paid (debits) were based on data received in the course of a special study. It is quite clear that the estimates for 1931, 1932 and 1933, which were not revised, are considerably too low. The estimates in 1928 and 1929 were, likewise, too high.

ings, and very substantial reductions in the par value of those holdings.

The extent to which interest and dividend receipts (credits) have lagged behind the other balance-of-payments items is shown in Table V. The influence of the income from the two types of investments is also shown. Income from portfolio investments—almost entirely interest—has declined steadily, while that from direct investments has increased. The failure of interest receipts to correspond in trend to the other items is typical. At the beginning of the depression they declined later and more slowly than the other items. Defaults did not start until 1931. The defaults stimulated to some extent the repatriation of foreign dollar bonds, so that the later resumption of partial or complete service did not have as great an effect on the total receipts as it would otherwise have had.

TABLE V

INDICES OF CERTAIN ITEMS IN THE BALANCE OF INTERNATIONAL PAYMENTS OF THE UNITED STATES, 1934–1937

(1934 = 100)

	1934	1935	1936	1937
Merchandise trade:				
Exports	100	107.0	115.1	156.8
Imports	100	123.7	146.4	186.3
Freight and shipping:				
Credits	100	103.3	111.5	175.4
Debits	100	103.1	134.4	218.7
Tourist expenditures:				
Credits	100	136.0	161.6	181.4
Debits	100	123.6	150.2	179.5
Interest and dividends:				
Credits—total	100	105.7	115.2	123.3
Direct	100	133.3	158.3	183.3
Portfolio	100	87.4	81.9	73.5
Debits—total	100	135.7	188.9	220.6

Source: Calculated from data given in U. S. Department of Commerce, *The Balance of International Payments of the United States.*

The resumption of service on defaulted bonds often awaits a considerable and apparently stable improvement of business. Without a resumption of service, new loans, except those where the government of the lending country is the guarantor or the lender, are very limited in volume. The result is that both the income from, and the volume of, the portfolio investments tend to lag several years behind the other items. Income from direct investments, on the other hand, has shown a trend closely corresponding to the other items in the balance of payments (see Table V). It is shown to be largely a reflection of business trends influenced to some extent by changes in exchange rates and by exchange restrictions. The trend of income from direct investments has been very similar to merchandise imports and tourist expenditures in foreign countries. There may be a rather direct connection between merchandise imports and income of this type because a large part of

the direct investments are in raw material industries and a large part of our imports are in the raw material category.

Interest and dividend payments (debits) increased more than the other items. Being largely dividends on common and preferred stocks, the payments are dependent to a considerable extent on prosperity of business. If that were the only factor, the increase should have been more nearly equal to that of imports and exports. The other factor was, of course, the large purchases of United States securities by foreigners, particularly since 1934. These large investments were dictated by political as well as economic considerations, and to the extent that political considerations were dominant the trend of the resulting income item would be different than that of other items not similarly affected.

TABLE VI

INDICES OF CERTAIN ITEMS IN THE BALANCE OF INTERNATIONAL PAYMENTS OF CANADA, 1928–1936

(1926–7 = 100)

	Merchandise		Freight		Tourist		Interest and dividends	
Year	Export	Import	Credit	Debit	Credit	Debit	Credit	Debit
1928.....	109.0	116.7	99.3	107.4	125.2	103.4	123.9	110.2
1929.....	95.8	124.0	94.5	121.4	140.8	117.3	144.5	129.4
1930.....	71.4	96.4	72.8	94.5	127.0	96.8	139.3	140.0
1931.....	49.1	60.0	56.0	73.3	114.1	73.7	117.8	132.8
1932.....	39.8	43.2	39.3	61.4	96.6	55.4	92.3	121.2
1933.....	42.6	38.3	45.2	61.4	53.3	49.1	91.3	105.9
1934.....	52.3	49.0	53.2	73.8	66.4	61.3	129.7	107.4
1935.....	58.8	52.5	70.6	76.6	97.7	88.3	145.2	106.8
1936.....	75.8	60.6	83.0	91.2	116.4	96.2	178.5	124.7

Source: Calculated from data given in Canada, Dominion Bureau of Statistics, *The Canadian Balance of International Payments, 1926–1936.*

Important items in the balance of international payments of Canada show a striking lack of uniformity in trend (see Table VI). Interest and dividends were the only item to show an increase in 1936 over 1928—44 per cent for receipts and 13 per cent for payments. These percentage relationships emphasize the varying trends of the returns from different types of investments. Most of the Canadian investments abroad are of the direct type, or are holdings of common stocks (equities), both of which are subject to widely fluctuating returns. Foreign investments in Canada include a large percentage of bond holdings the returns from which usually decline during and after a depression. The slight increase in total payments resulted entirely from the increased payments on direct investments. Merchandise exports declined 30 per cent during the same period, imports 48 per cent, freight receipts 16 per cent, and freight payments 15 per cent, and tourist expenditures, both receipts and payments, 7 per cent. The general direction of the fluctuations of the different items corresponded with a year's lag here and there, but the amplitude of the fluctuations differed widely.

The British balance of payments was more nearly similar to that of the United States than that of Canada. The range of fluctuations was not as great as that of either of the latter countries (see Table VII). To be sure, the British figures, except those of exports and imports, were net, but in both shipping and interest and dividends the deductions from gross receipts were relatively quite small and would have but little effect on the result. Interest and dividend receipts did not decline as far as the other items during the depression and have since risen higher. The fluctuations, in both direction and volume, corresponded more closely to those of net shipping income than to those of the merchandise trade.

TABLE VII

INDICES OF CERTAIN ITEMS IN THE BALANCE OF INTERNATIONAL PAYMENTS OF GREAT BRITAIN, 1928-1936

(1926-7 = 100)

Year	Merchandise		Net shipping income	Net interest and dividends
	Exports	Imports		
1928.....	104.8	97.3	100	100
1929.....	104.2	99.2	100	100
1930.....	81.8	64.9	80.8	88
1931.....	56.6	70.2	61.5	68
1932.....	51.8	57.3	53.8	60
1933.....	51.9	55.3	50.0	64
1934.....	56.5	60.8	53.8	68
1935.....	65.8	64.3	57.7	72
1936.....	63.8	69.9	73.1	78

Source: Calculated from data given in the League of Nations Memoranda on, *Balances of Payments*.

The varying trends of the returns from the different classes of investments have been noted at several points of this discussion, which related to individual countries. The principal division made has been that between interest and dividends. Still further general divisions of dividend returns may be made. First, there are the returns from the foreign direct investments of the United States. Such investments involve the control of foreign enterprises and the typical form of return is dividends paid out of earnings. This division may be subdivided into, (1) the returns from raw-material-producing enterprises which are subject to and very sensitive to price changes; (2) the returns from manufacturing enterprises which are less sensitive, and (3) the returns from public utility enterprises which do not change rapidly nor widely. Second, there are the dividends paid on miscellaneous holdings of common and preferred stocks such as form so large a part of foreign long-term investments in the United States. Covering relatively small holdings in a wide range of enterprises, the returns from this group, as a whole, fluctuate less than those from some types of direct investments but far more than the interest from bonds.

IV

It is evident by this time that the dividend payments and receipts are affected by the same factors which affect other trade and service transactions and only slightly by capital movements, whereas interest payments and receipts are quite closely related to capital. It is evident, also, that other service items are not solely dependent on the forces which affect trade. Freight and shipping charges, for example, are related to rates as well as to the volume and value of foreign trade. Immigrant remittances and charitable contributions are related to the need for assistance as well as to the ability to give it. It is a mistake to think that merchandise trade, because of its volume, governs or marks the proper course of the other items. Each series of items is dependent upon a separate combination of factors and each must in most cases be considered separately.

Some students have suggested that in the physical arrangement of the balance-of-payments data, the interest and dividend account should be excluded from the service items.[5] This exclusion of interest and dividends from the service items has been supported largely by the argument that interest and dividends are governed by contractual relations, whereas the trade and other service items are dependent upon business conditions. The preceding analysis has shown that that argument is only partially true, that is, as to interest payments and receipts only. It represents a generalization based on the impression in many people's minds that the foreign investments of the United States and of other countries are largely interest-bearing obligations. This impression has tended to belittle the importance of direct investments and portfolio holdings of common stocks which have comprised over half of the total foreign private long-term investments of the United States throughout its history and an important part of the foreign investments of other creditor countries.

In 1934, the returns from direct investments (dividends) comprised over half of the total interest and dividend receipts of the United States. In 1937, they comprised over 72 per cent of the total receipts. On the payments side, returns from direct investments, plus dividends on common stocks, have, in recent years, comprised over 80 per cent of total payments of interest and dividends by the United States. The facts regarding most countries would tend to de-emphasize interest payments and receipts and increase the emphasis on dividend pay-

[5] *International Economic Relations*, Report of the Commission of Inquiry into National Policy in International Economic Relations, pp. 136–7. University of Minnesota Press, 1934.

ments and receipts. Only in certain cases, however, do direct investments occupy a relatively minor position.

Narrowed down to the interest item, there might be some justification for excluding it from the trade and service group, because of the contractual relationship, providing that the other trade and service items were themselves governed by identical combinations of forces. Inasmuch as they are not so governed, each being peculiar unto itself, and governed by different sets of circumstances, the argument, even as it relates to interest, breaks down. Unless one is prepared to advocate that no grouping of balance-of-payments items is desirable, it seems necessary to admit that, for general purposes, the interest and dividend account may logically be classed with the service items. For purposes of special analyses any of them may be separated from the others.

V

What practical conclusions may be drawn from this analysis? The first conclusion follows from the fact that dividends form an important part, statistically, of the interest and dividend item and that dividends are subject to fluctuations which are very similar in volume and direction to those noticed in the other items. This being true there would not seem to be any great hardship placed on the balance of payments of a country by reason of the necessity for transferring dividend payments during a depression,[6] during which time they would naturally be greatly reduced in volume, and would require no greater proportion of the exchange assets than in times of prosperity.

The second conclusion follows from the first and from the experience of various countries. In other words, interest payments (exclusive of dividends), even though somewhat inflexible in volume, do not comprise by themselves a very large part of the trade and service items of the balance of payments, and only occasionally is the burden on the exchange resources of a country sufficiently heavy to justify defaulting on interest payments.

It is not possible to separate interest from the returns from direct investments in the balance of payments of most countries so that, in judging the validity of that conclusion by the experience of other countries, it will be necessary to compare the entire interest and dividend burden with the other balance-of-payments items. That is done in Table VIII.

[6] There are, of course, several conflicting tendencies at work at such times. Some imports and services are occasionally of more pressing importance than others—imports of military supplies, for example. On the other hand, foreign investments may be yielding a large part of the foreign exchange available for paying for such imports and services.

TABLE VIII

INTEREST AND DIVIDEND PAYMENTS AS A PER CENT OF TOTAL TRADE AND SERVICE CREDIT ITEMS,* 1929 AND 1935

Country and Default Status	1929	1935
Argentina (defaults small)	22.0	27.0
Australia (no defaults)	25.2	31.5
Canada (defaults insignificant)	18.2	22.2
Czechoslovakia (defaults small)	4.5	18.3
Germany (defaults almost complete)	8.0	11.1 (23.5)
Hungary (defaults complete)	14.4	5.8 (37.7)
Japan (no defaults)	4.4	3.9
Norway (no defaults)	6.2	7.5
Poland (no defaults through 1935)	10.9	12.5

Note: Figures in parentheses represent the 1929 interest and dividend payments as a per cent of 1935 total trade and service credit items.

Source: Calculated from data present in the League of Nations Memoranda on *Balance of Payments.*

* See footnote 2, *supra.*

The data in Table VIII indicate that some countries which did not default on their foreign obligations had heavier burdens to bear than others which did default. In several of these cases the debt service burden increased considerably from 1929 to 1935. In other countries which did not default the debt burden increased but little. The most evident conclusion to be drawn from these data and from the general considerations given earlier in this article, is that defaults are in many cases more psychological and political than economic phenomena. In other words, certain countries, where the economic justification for defaulting on their foreign obligations seemed most clear, chose rather to serve those obligations in full, while other countries, which had much less economic justification, chose to default in whole or in part. Definite conclusions on this point cannot be drawn on the basis of percentages. Other factors, such as the character of the other debit and credit items, must be considered.

By way of summary, it may be noted, first, that the interest and dividend item is dependent upon capital movements in its long-term trends but is relatively independent in its short-term trends. Second, the returns from direct investments and dividends on common stocks fluctuate in rather close conformity with the prosperity of business and are very similar in volume and direction to the fluctuations of other items in the balance of payments. Third, a comparative study of the balance of payments of several countries indicates that, in some cases, the justification for defaults is not entirely an economic one.

SEASONALITY IN STRIKES

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That there is a pattern of seasonal variation in strikes in the United States is suggested by even the most cursory examination of the monthly data representing such disputes. In the recent study of "Strikes in the United States, 1880–1936,"[1] the author observes that, "In general, the smallest number of strikes occur during the winter months from November through February. . . . Strikes begin to increase in the spring, especially in May, and remain at a relatively high level all summer. . . . About the same seasonal characteristics pertain to the number of workers involved in strikes. . . . In general, the number of man-days idle because of strikes increases each spring and summer and is lowest during December and January."

The general pattern of seasonality thus broadly described is clearly evidenced in the data of Table I, which summarizes the numbers of strikes beginning in each month from January, 1927 through December, 1936. It may be observed that the average number of disputes per month throughout this period varies from a low of 59.8 for December to a high of 132.6 in August and a similarly large average of 131.6 for May. December, November, February, January, March, and October, in the order mentioned, have lowest averages. August, May, September, April, July, and June, in that order, have highest averages.

TABLE I

NUMBER OF STRIKES BEGINNING EACH MONTH, JANUARY, 1927 THROUGH DECEMBER, 1936

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1927	35	63	70	84	95	80	55	56	58	50	28	33	707
1928	45	46	41	69	80	44	56	53	48	60	37	25	604
1929	50	51	68	121	121	77	81	86	99	73	60	34	921
1930	49	49	47	68	58	61	79	53	68	42	36	27	637
1931	58	52	53	78	104	66	67	78	81	68	57	48	810
1932	88	60	63	89	91	74	72	89	86	50	43	36	841
1933	83	67	106	89	161	154	237	261	233	145	87	72	1695
1934	98	94	161	210	226	165	151	183	150	187	130	101	1856
1935	140	149	175	180	174	189	184	239	162	190	142	90	2014
1936	167	148	185	183	206	188	173	228	234	192	136	132	2172
Total	813	779	969	1171	1316	1098	1155	1326	1219	1057	756	598	12257
Mean	81.3	77.9	96.9	117.1	131.6	109.8	115.5	132.6	121.9	105.7	75.6	59.8	

[1] Florence Peterson, "Strikes in the United States, 1880–1936," Washington, Bureau of Labor Statistics, 1938 (Bulletin 651).

For the period as a whole, strikes beginning in the month appear to be relatively infrequent in early months of each year, to increase rapidly in April and May, to decline slightly in June and July, to increase again in August and September, and then to decline through November to the lowest point in December.

In the period represented by Table I, however, there is considerable variation in the numbers of strikes within each of the months. The months do not occupy the same relative positions throughout all the years. The month-to-month variation is not, in other words, perfectly consistent, so that there may be question whether the seasonal pattern is sufficiently marked to be really significant. In other words, there may be a question whether that pattern is sufficiently distinctive so that differences among the months and among the averages for these months cannot be explained by mere chance variability.

If the seasonal pattern is significant, if the apparent differences cannot be explained by chance, the raw data of strikes can be made more meaningful by reference to measured seasonal fluctuation. If strike data were so adjusted, numerous comparisons with other adjusted series representing changing business and economic conditions might be facilitated. The possible importance of such comparisons is suggested by the fact that the data of strikes represent almost the only quantitative index of industrial unrest throughout the nation.

There are several continuing series describing the frequency and extent of strikes in the United States. All of them are maintained by the Bureau of Labor Statistics and are released regularly in the *Monthly Labor Review* and in frequent special bulletins. The two most extensive series are those that describe the number of strikes beginning in each month and the numbers of workers involved in these strikes. Continuing series of monthly data for the number of strikes have been maintained since 1915, and annual totals are available for the period since 1914. For earlier years, only discontinuous reports are available. In the monthly data of strikes "beginning in the month" from 1915 to 1926, possibly 10 per cent of the strikes are of unknown monthly origin, so that the data for these years are not satisfactory as indicating seasonality. Since 1927, however, the monthly origin has been accurately recorded, and additional information has been secured, so that present series describe not only the number of strikes beginning in the month, but also the numbers ending in each month, the number in progress during the month, numbers of workers involved

in these strikes, and man-days of idleness occasioned by them.[2]

Most reliable monthly data are thus restricted to the period since January, 1927. It is proposed here to examine some of those data to appraise the reality and significance of a seasonal pattern in them. Attention is particularly directed to the series describing the number of strikes beginning in each month, since items of that series enjoy a degree of independence that is not characteristic of some of the other data, especially those describing the numbers of strikes in progress during the month.

TABLE II

CALCULATION OF THE CRITICAL RATIO, d/σ_d

Data: see Table I.

	January X	December Y	Difference $X-Y=G$	G^2
	35	33	2	4
	45	25	20	400
	50	34	16	256
	49	27	22	484
	58	48	10	100
	88	36	52	2704
	83	72	11	121
	98	101	−3	9
	140	90	50	2500
	167	132	35	1225
Total	813	598	215	7803
Mean	81.3	59.8		

$$d = 81.3 - 59.8 = 21.5$$
$$\Sigma g^2 = \Sigma G^2 - (\Sigma G)^2/n = 7803 - 4622.5 = 3180.5$$
$$\sigma_g^2 = \Sigma_g^2/n = 3180.5/10 = 318.05;\ \sigma_g = 17.82$$
$$\sigma_d^2 = \sigma_g^2/(n-1) = 318.05/9 = 35.339;\ \sigma_d = 5.94$$
$$d/\sigma_d = 21.5/5.94 = 3.6$$

A preliminary approach to the question of the significance of seasonality has been made by comparing the differences between monthly averages, indicated in Table I, with the standard errors of these differences. The so-called "critical ratio," d/σ_d, has been calculated for each of the paired monthly averages. Because there is some positive correlation between the items of each pair of months (due to different yearly levels of strikes), the method of "gains" has been used in calculating the critical ratios. The procedure is illustrated in Table II, and the resulting critical ratios are summarized in Table III.

[2] For details as to available data see Florence Peterson, *op. cit.* and "Methods Used in Strike Statistics," this JOURNAL, 32, (1937), 90–96; Paul H. Douglas, "An Analysis of Strike Statistics, 1881–1921," *ibid.*, 18, (1923), 866–877; H. M. Douty, "The Trend of Industrial Disputes, 1922–1930," *ibid.*, 27, (1932), 168–172: A. H. Hansen, "Cycles of Strikes," *American Economic Review*, 11 (1921), 616–621.

TABLE III

CRITICAL RATIOS, d/σ_d, FOR MONTHS, 1927–1936

Data: see Table I.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Jan.	—	.71	1.93	2.38	4.37	3.12	2.33	2.90	2.92	2.16	.85	3.65
Feb.	.71	—	2.60	4.04	5.02	3.58	2.40	2.86	2.75	2.43	.36	3.20
Mar.	1.93	2.60	—	2.97	5.13	3.12	1.40	2.46	1.90	1.54	3.93	5.00
Apr.	2.38	4.04	2.97	—	1.96	.74	.09	.78	.27	1.17	6.00	6.25
May	4.37	5.02	5.13	1.96	—	2.99	1.21	.07	.76	4.15	8.12	8.77
June	3.12	3.58	3.12	.74	2.99	—	.60	1.98	1.19	.77	5.37	2.81
July	2.33	2.40	1.40	.09	1.21	.60	—	2.12	.89	.88	3.14	4.03
Aug.	2.90	2.86	2.46	.78	.07	1.98	2.12	—	1.20	2.34	3.56	4.04
Sept.	2.92	2.75	1.90	.27	.76	1.19	.89	1.20	—	1.40	3.44	4.67
Oct.	2.16	2.43	1.54	1.17	4.15	.77	.88	2.34	1.40	—	4.35	4.56
Nov.	.85	.36	3.93	6.00	8.12	5.37	3.14	3.56	3.44	4.35	—	3.10
Dec.	3.65	3.20	5.00	6.25	8.77	2.81	4.03	4.04	4.67	4.56	3.10	—

For ten variables, the one per cent level of significance for such critical ratios is somewhat greater than three standard errors, being approximately 3.25. The 5 per cent level is approximately 2.26. Twenty-one of the 66 inter-month critical ratios are above the one per cent level, and 18 additional ratios are above the 5 per cent level. It would appear, therefore, that there are significant seasonal differences.

As a further test, however, the data of Table I have been subjected to dual variance analysis. The procedure is not unusual in any respect, having been used for similar purposes in numerous other connections.[3] It is presented in summary form in Table IV. Major steps in the process may be outlined as follows: (1) Totals for all items in Table I and for their squares are first noted and designated $\sum Y$ and $\sum Y^2$, respectively. These totals are 12,257 and 1,660,688. (2) Individual column totals (designated $n_c M_c$, to indicate the number of items per column multiplied by the mean of the column) are then noted and totaled, as are their squares. The same manipulation is applied to row totals and their squares. The sum of squared column totals is designated $\sum n_c^2 M_c^2$, and the sum of squared row totals is designated $\sum n_r^2 M_r^2$. (3) These sums are divided by the number of items per column and per row respectively to obtain $\sum T_c^2$ and $\sum T_r^2$. (4) $\sum y^2$, the sum of the squared deviations in the whole table, is then found as $\sum y^2 - (\sum Y)^2/n$, and the values of $\sum T_c^2$ and $\sum T_r^2$ are reduced by the same centering correction to provide $\sum t_c^2$ (the total of squared devia-

[3] See G. R. Davies and Dale Yoder, *Business Statistics*, New York, John Wiley and Sons, Inc., 1938, pp. 406–425; T. W. Schultz and G. W. Snedecor, "Analysis of Variance as an Effective Method of Handling the Time Element," this JOURNAL, 28 (1933), 14–30; F. C. Mills, *Statistical Methods*, New York, Henry Holt and Co., 1938, pp. 522–530.

tions among the columns) and $\sum t_r^2$ (the total of squared deviations among the rows). (5) The residual measure of interaction, $\sum s^2$, is then directly available by subtraction as indicated. (6) The values thus obtained are divided by their appropriate degrees of freedom (for the whole table, $n-1$; for the columns, the number of columns minus 1; for the rows, the number of rows minus 1; and for the residual, $n-1$ minus the sum of those accorded columns and rows) to discover the corrected mean squares. as shown in the lower portion of the table (7) Values of F for column and row variance are then measured as ratios of the corrected mean squares of columns and rows to the residual mean square.

TABLE IV

SUMMARY OF VARIANCE ANALYSIS

Data: See Table I.

Column totals n_cM_c	$n_c^2M_c^2$	Row totals n_rM_r	$n_r^2M_r^2$
813	660,969	707	499,849
779	606,841	604	364,816
969	938,961	921	848,241
1,171	1,371,241	637	405,769
1,316	1,731,856	810	656,100
1,098	1,205,604	841	707,281
1,155	1,334,025	1,695	2,873,025
1,326	1,758,276	1,856	3,444,736
1,219	1,485,961	2,014	4,056,196
1,057	1,117,249	2,172	4,717,584
756	571,536		
598	357,604	12,257	18,573,597
12,257	13,140,123		

ΣY (total of all items) = 12,257

ΣY^2 (total of squares of all items) = 1,660,688

$\Sigma T_c^2 = \Sigma n_c^2 M_c^2 / n_c = 13,140,123/10 = 1,314,012.3$

$\Sigma T_r^2 = \Sigma n_r^2 M_r^2 / n_r = 18,573,597/12 = 1,547,799.75$

$\Sigma y^2 = \Sigma Y^2 - (\Sigma Y)^2/n = 1,660,688 - 12257^2/120 = 1,660,688 - 1,251,949.59 = 408,738.41$

$\Sigma t_c^2 = \Sigma T_c^2 - (\Sigma Y)^2/n = 1,314,012.3 - 1,251,949.59 = 62,062.71$

$\Sigma t_r^2 = \Sigma T_r^2 - (\Sigma Y)^2/n = 1,547,799.75 - 1,251,949.59 = 295,850.16$

$\Sigma s^2 = \Sigma y^2 - (\Sigma t_c^2 + \Sigma t_r^2) = 408,738.41 - (62,062.71 + 295,850.16) = 50,825.54$

Corrected Mean Squares

	Squares	Degrees of freedom	Mean squares
Whole table	$\Sigma y^2 = 408,738.41$	$n-1=119$	—
Columns	$\Sigma t_c^2 = 62,062.71$	$n_r-1=11$	5642.06
Rows	$\Sigma t_r^2 = 295,850.16$	$n_c-1=9$	32872.24
Residual	$\Sigma s^2 = 50,825.54$	$(n-1)-[(n_r-1)+(n_c-1)]=99$	513.38

$F_c = 5,642.06/513.38 = 10.9$. The least highly significant value is 2.6.

$F_r = 32,872.24/513.38 = 64.0$. The least highly significant value is 2.7.

When the values of F thus obtained are compared with chance expectancies, as the latter are indicated by the one per cent values noted in the table, it is apparent that variance in both columns and rows is highly significant, being many times that which might be expected by chance. The analysis effectively supports the conclusion suggested by the critical ratios to the effect that inter-monthly variation is far beyond mere chance expectancy.

TABLE V

RANKING CHI-SQUARE TEST APPLIED TO SEASONAL RELATIVES

Data: Ratios to 12-month moving averages of the data of Table I.

Period	Rank of month in twelve-month period											
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1927–28	8	9	10	6	1	2	5	7	3	11	12	4
1928–29	9	8	5	10	2	1	4	3	6	12	11	7
1929–30	8	9	12	6	5	1	2	3	4	11	7	10
1930–31	11	7	9	3	2	1	6	5	4	10	12	8
1931–32	6	8	9	5	2	1	11	3	4	10	12	7
1932–33	8	12	11	4	2	1	7	3	6	5	10	9
1933–34	11	12	10	5	2	1	3	4	6	8	9	7
1934–35	6	12	5	11	2	1	3	4	8	9	7	10
1935–36	9	12	4	10	2	1	5	3	8	6	11	7
Total	76	89	75	60	20	10	46	35	49	82	91	69
Squares	5776	6241	5625	3600	400	100	2116	1225	2401	6724	8281	4761

$\Sigma X = 702$; $\Sigma X^2 = 47{,}250$

$\Sigma x^2 = \Sigma X^2 - (\Sigma X)^2/n = 47{,}250 - 41{,}067 = 6{,}183$

$\chi_r^2 = 6\Sigma X^2/\Sigma x = 37{,}098/702 = 52.85$. (The 1 per cent probability is 25.)

There remains the possibility that the data show such a well-defined, simple trend that the influence of the latter accounts for the differences between months. In order to appraise that possibility, two additional tests have been applied. In the first, seasonal relatives have been calculated for each of the months (as ratios to a twelve-month moving average), and dual variance analysis has been applied to these seasonal relatives. The use of the twelve-month moving average in this connection should effectively eliminate or greatly reduce the influence of the trend.

The procedure is not presented here in detail, since it is almost identical with that illustrated in Table IV. When the dual variance analysis is applied to the seasonal relatives, however, the value of F for inter-year variability is found to be 1.146. The five per cent value for F in this connection is 2.0, and the value found clearly evidences the effectiveness of the relatives in removing significant inter-yearly variation. The value of F for inter-month variability is, however, 14.095. The

one per cent chance value is 2.5. The result clearly indicates, therefore, that, with trend removed, the inter-monthly variability is many times the highly significant probability.

A final check on the foregoing conclusion is provided by the application of the ranking χ^2 test to the seasonal relatives. The method has been recently discussed in this JOURNAL,[4] but the particular procedure used here involves a simplification suggested by Professor G. R. Davies. Table V summarizes the process. Its result indicates that the monthly pattern cannot reasonably be attributed to chance, since the one per cent value of χ^2 in this connection is approximately 25, while the actual value found is 52.83.

It would seem apparent, therefore, that there is a highly significant seasonal pattern in the data of strikes, a pattern that cannot be attributed to any trend or cyclical influences but appears in spite of all such influences. Under the circumstances, it would appear distinctly desirable that this seasonal pattern be recognized, so that normal month-to-month changes might not be mistakenly interpreted as indicating more fundamental or far-reaching movements. Moreover, since there is well-established use of seasonally adjusted data of numerous other series, it might be well to release strike data in similarly adjusted form.

As a step in that direction, seasonal indexes have been calculated from the data of Table I by ratio-to-moving average and median link relative methods. Crude moving average indexes have been calculated as means of the three central seasonal relatives for each month, and these crude measures have then been refined by expressing each as a ratio to their average. The indexes thus calculated are presented in Table VI.

TABLE VI

SEASONAL INDEXES OF STRIKES BEGINNING IN THE MONTH

	Link relative method	Ratio to moving average method
January	89.4	91.7
February	84.8	81.0
March	95.5	91.2
April	127.6	121.4
May	137.8	139.4
June	110.7	115.5
July	109.3	111.0
August	123.5	117.7
September	119.8	115.1
October	93.1	98.0
November	63.4	65.8
December	45.1	52.4

[4] Milton Friedman, "The Use of Ranks to Avoid the Assumption of Normality Implicit in the Analysis of Variance," this JOURNAL, 32 (1937), 675–701.

POPULATION ESTIMATES OF LOCAL COMMUNITIES AND ECONOMIC PLANNING

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The great importance of urban population estimates and particularly forecasts in economic planning is not generally appreciated. Over a period there is a definite relationship between the growth of the number of inhabitants and the expansion of private enterprises and governmental facilities. The need for various local utilities and public works; for housing, schools, shopping and recreational facilities; and for local service industries is definitely related to the population growth. To provide all these instrumentalities which involve capital items with lives extending over periods of twenty-five to fifty years, or longer, without overbuilding or underbuilding is a challenge to the ablest statistician and executive. The importance of the challenge is found in the fact that 56 per cent of our population resides in urban centers.

In our urban communities in the past there has been repeatedly a woeful lack of balance between demand and supply of these facilities and services. With proper intercensal estimates and postcensal forecasts of population growth and distribution as a guide, numerous losses through superabundance or inadequacy could have been partially or wholly avoided. In prognosticating economic needs in any community, for example, properly prepared and applied per capita data are of great assistance. Fairly definite future trends can be determined by past performance of representative per capita annual consumption of various classes of food, furniture, and clothing; of water, gas, electricity; of telephones per 100 families; of persons per automobile; of electric railway or bus rides per capita; of persons per classified retail outlet; of various levels of income and buying power per capita; of square feet of office space per person; of hospital beds per 1000 persons, etc. Comparative studies can be made to detect undersaturation, oversupply and future potentialities. The inference should not be made, however, that this definite long time relationship makes any of these units an acceptable basis for population estimates. While per capita use is valuable in studying the consumption trend of particular goods and services, the units themselves have varying degrees of merit as a basis of population estimates because of fluctuating usage, and because of inherent characteristics from a statistical standpoint. Therefore, as will be shown later, first preference is given to units which are most

closely related to population changes and which have the least skewness such as family capacities, families and persons per family, and the other units are given second or third preference, or ruled out altogether. In other words, the aim is to select those units which have the least probable error in making population estimates and use the others if possible corroboratively.

CLASSES OF URBAN POPULATION

The infrequency of official governmental censuses compels annual estimates of local population growth to meet the needs of urban and suburban communities. These estimates are usually based upon such indices as water, gas and electric meters or services, telephones, registered voters, school and postal data, city directories, assessed valuation, and building data. While in some instances the estimates are carefully made, generally, the limitations and qualifications of the data are not known or realized. The results are often of questionable value because scientific approach and methodology are not used consistently. Population estimates and related data of a locality, from supposedly responsible sources, have been known to vary 25, 50, and even 100 per cent. Such conflicting data invariably cause confusion, have their reactions, and are a liability.

Happily some states take their own decennial censuses midway between the Federal census, thus, data are available every five years, which give more frequent official anchorage. However, governmental censuses are not as representative as is ordinarily believed by the user of such data. The national population census, for instance, is required by the Constitution and initially was designed primarily as a basis for the apportionment of taxes and governmental representatives. Therefore, the Federal Bureau of the Census enumerates persons at their "usual place of abode," or "the place which they would name in reply to the question 'Where do you live?'" or "the place which they regard as their home." The instructions to enumerators elaborate upon the meaning of these and other terms but the basis is still subject to broad interpretation.

The persons so enumerated may be termed "permanent population," but this is not necessarily the population which is demanding food, clothing, housing, public utility services, governmental facilities, or personal and financial services in a particular locality. There may be several groups of population. In any sizable urban area there are usually four classes of persons (1) permanent population, or Federal census population, usually those who claim a locality as their regular

place of abode, or home, or where they live (2) non-permanent population, those seeking retirement, work, education, health or recreation, who customarily live in a community for many months or even years at a time in furnished single or multiple dwellings, in hotels, boarding houses, or in summer or winter homes of their own (3) traveling transient population who live in hotels, auto courts or camps, trailers, construction camps, and the like, usually for a few days or several weeks (sometimes months) (4) daytime transient population, those who come from the surrounding suburbs or rural areas and remain a day or some part of a day for work, business or recreation. For want of better terminology these four urban classes may be briefly designated as (1) "permanent residents" (2) "nonpermanent residents" (3) "traveling transients" (4) "daytime transients."

In certain communities many persons living there almost continually will not declare it their regular residence or their usual place of abode, or will not change their legal situs to conform to their regular residence because of home ties, taxation obligations, political or financial reasons, wanderlust, etc. The actual population to be served from an economic standpoint and used as a basis for planning, therefore, may be much larger than that enumerated by the Bureau of the Census due to the regular or irregular movements of retired persons, tourists, workers, students, shoppers, military personnel, etc. From data gathered in many field surveys by the author, the total resident population in sizable communities at a given census date has exceeded the so-called census permanent population from 18 to 120 per cent, and there is considerable evidence that the Census enumeration is occasionally a gross understatement of even the permanent population.[1] On the other hand, nonpermanents excluded in one locality are included in some other locality as permanents by the census. This may concentrate upon particular localities and thus cause the census population to be far in excess of the actual average annual resident permanent population. This proves further than certain local economic planning should be based upon tributary resident population rather than census theoretically permanent population.

These conditions cited emphasize the need for a scientific estimate, even at the time of the Federal enumeration, as a check upon the accuracy and representativeness of the census itself. To some this may appear preposterous, but it certainly would be insurance against glaring errors.

[1] For instance, economic planning surveys based upon thorough field censuses conducted for a telephone company of communities involving a population of approximately 500,000 brought out a number of these discrepancies.

Population estimates and forcasts are one of the mainstays in most pieces of local planning work, and the federal census population data are extremely valuable, in fact indispensable, but these data must be used with discrimination. Many consider the federal census population count of their community as *the* population. However, it has been shown that there are four distinct classes of urban population, and the specific use determines the classes to be included. For example: A rapid transit or surface railway study in a metropolitan area must encompass all four classes. Indeed the existing and probable future daytime transients in this case comprise one of the most important groups. The number of daytime transients largely determines the downtown shopping, restaurant, and theater floor space, the downtown street, automobile parking and utility capacity, and the elevator facilities in stores and office buildings in the business center. When we study births, deaths and marriages, the daytime transients are obviously ruled out, while the prevailing number of traveling transients and nonpermanents, always in a large city, may have some bearing on certain phases of these vital statistics. An analysis of property taxation or public debt in relation to population would be confined largely to the census or permanent resident population, but a sales tax analysis would again include all four classes. The number and class of traveling transients would determine the supply of hotel and lodging house accommodations, while the number and class of nonpermanent residents would be a main demand factor in the provision of furnished single and multiple dwellings. For water, gas, electric production and sewage disposal all four classes must be considered in a given locality, but for the outside plant facilities (pipes, lines, substations, etc.) in the non-downtown areas the number and distribution of permanents and nonpermanents control. Local telephone exchange service is predicated largely upon the two classes of permanents and nonpermanents, but the supply of pay station and toll service is influenced by the number and activities of the traveling and daytime transients.

These examples indicate that our urban population is a heterogeneous mass of persons composed of several groups which must be differentiated, and that the federal census covers only the number and distribution of one group in a given urban area.[2] Private and local governmental agencies therefore have been compelled to study and determine the status and trend of the other three groups in specific undertakings.

[2] In this connection, I raise the question whether Edward L. Thorndike in his article "Variations Among Cities in Per Capita Income" has sufficiently taken into account the effect of the three classes of population herein defined besides the census permanent population (this JOURNAL, September, 1937, pp. 471–479.)

The purpose of this article is not to make a qualitative analysis, but to confine the remarks as much as possible to the quantitative aspect, that is, to throw some light on obtaining the right number of persons for specific local purposes, and these remarks are intended to be indicative and not conclusive. Thus, if we are forced to make intercensal and postcensal estimates of our urban population and its distribution within a local area, what are some of the rules and considerations that apply in this procedure?

1. Determine what class or classes of population are applicable to the planning problem in hand.
2. Select a simple unit or units whose changes are most closely related to the specific population changes to be measured.
3. The area of the subject for study and the area of population should be coextensive.
4. The population indices should be available monthly or annually from reliable sources.
5. Avoid units or methods which are involved and excessively costly to apply.
6. When forecasting population changes in a local area, or its sub-areas, study the whole historical record of the growth with respect to the causes for change; the sources of increase as to the proportion of natural increase, immigration and annexation; the past and probable future trends in numbers and percentages tabulated by significant periods and measured by plotting according to arithmetic and geometric scale taking into account the probable future causes and sources of change.

The reason for unrepresentative estimates and consequent economic losses is that the above rules have been ignored or violated in whole or in part, while faulty forecasts are brought about for the same reasons except that unforeseen conditions arise such as the discovery of ore or oil, unusual governmental or institutional activities, or major changes in transportation routes which sometimes make population growth temporarily unpredictable.

CHECKS UPON CITY GROWTH

It is clear that the growth of inhabitants of any locality is more or less dependent upon the general trend of population growth in this country and in the civilized world at large. The status and trend of the birth rate, death rate, emigration and immigration all ultimately have a bearing upon the future growth of any locality. The long time growth of a city should be analyzed as to the proportions of inhabitants obtained from natural increase, from local and international net immigration and from annexation.[3] Decentralization of such activities as manufacturing and retail trade is having an important bearing upon the growth of our large urban centers and their suburbs. On the other

[3] *Annals of the American Academy of Political and Social Science* (November, 1936), pp. 167–176, et al.

hand, our rural areas are passing through an epochal transformation. The small cross-roads-general-store type town is disappearing and in its stead is developing the larger chain store shopping and amusement center. Here centralization in the form of urbanization is going forward rapidly and no doubt has its effect upon the rural rate of natural increase.

VARIOUS UNIT BASES

According to the rules suggested a number of units or indices eliminate themselves. Monetary units such as bank clearings, value of building permits, assessed valuation or postal receipts, which fluctuate with business volume and prices, are definitely unsatisfactory. The number of registered voters which varies with the intensity of political campaigns, usually regardless of population status, is of questionable validity. Note the wide fluctuation often in the number of registered voters for local and national elections in the same year. Studies over a period of years have proven that the number of persons per voter is very erratic. Furthermore, it does not reflect changes in the size of family and it excludes foreigners. The long time trend is affected by registration requirements such as sex distinction, age limits, naturalization, etc.

The number of names in a city directory is often used as a basis of urban population estimates. It has many limitations, such as listings of suburban or outside residents in business in the respective city; it may violate the area requirements which is difficult to correct; occupied adults are listed while women at home and children are omitted, and it does not reflect changes in size of family unless the factor of persons per net name is adjusted. It is not always available annually, and the canvass of listings is spread over a considerable period, thus, there is uncertainty of fixing a definite date. The inclusiveness of names depends upon the efficiency of the field personnel and thoroughness of canvass; and a progressive improvement from the census, or base year, will result in too high an estimate. It is not an official source. During the twenties the author carried on historical studies of city directories of Los Angeles as a basis for population estimates, but found them of problematical value.

Water, gas and electric meters or services as indexes of population growth have varying degrees of reliability. Utility serving areas often do not conform to city or study area boundaries; several companies may serve a city; all meter districts, or parts of such districts, outside of the study area should be excluded both in the base year and in the year of estimate; the change in the proportion of master meters is a

likely source of error; the increasing proportion of business meters will distort the estimate, therefore, residence meters are preferable; duplicate breakdown electric meters should be eliminated; the federal census permanent persons per meter in the base year excludes the nonpermanent persons served, and subsequent changes in the ratio of nonpermanents served vitiates the comparability of estimates, particularly of presumably permanent persons, with those of the census year. Telephone station data present certain difficulties cited for meters, especially area differences. They are subject to such relatively wide variations in usage caused by cyclical business conditions, and disproportionate growth of extensions as to make them a difficult gauge of population growth. Estimates based upon primary residence stations with due regard to changes in saturation give a more reliable estimate of population growth than total stations.

In the last analysis, since practically every family capacity in an urban area has a water meter or service connection, the number of these meters or services is a fairly acceptable basis for population estimates, because they are not so subject to increased saturation and discriminate uses as electric meters or telephones. Gas meters, in a measure, in some areas of intensive use, have the same characteristics as water meters. Both, however, are subject more or less to the limitations cited above.[4]

Average daily attendance and enrollment in the elementary school grades, first to eighth, is a usable index of population changes, if properly qualified and applied. High schools, junior colleges, special adult schools, etc. have a variable enrollment not consistent with intercensal population growth. Changes in laws for compulsory attendance, efficiency of truancy law enforcement, declining birth rates,[5] differentials in the proportion of permanents and nonpermanents (the latter usually with fewer children per family than permanents) in the

[4] Cautions which particularly apply to water meters are as follows: The term water services or meters is occasionally used to include dead-end connections, that is, those ends of consumer service pipes still in the ground but not used. These may never be used due to removal or destruction of buildings, as, for instance, the replacement of many small residences by large stores, manufacturing establishments, public buildings, or by schools, parks, etc. The consumer service connections laid to the property lines of vacant lots in subdivisions where streets are hard-surfaced are frequently included as meters and services, but represent no family occupancies. Additional sources of error are the lack of distinction between active and inactive meters; the presence of flat rate, or unmetered services, in presumably completely metered areas; the fact that water meters are kept active to care for lawns, shrubs, and trees even when the premises are vacant; the individual family capacity vacancies are not disclosed in multiple family houses having master meters, and the increased proportion, after the base year, of meters or services representing public uses such as city departments, schools, parks, fire hydrants, sewer flushing, etc., will cause over-estimates of population. Likewise, doubling up of families, as during the last depression, is not recorded by water meter data.

[5] Paul V. Lane of the California Taxpayers Association has prepared an estimate of birth rate correction factors for California.

base year and subsequent estimate years,[6] ratio of private and parochial school pupils, fluctuations in child labor, changes in school district boundaries, and transfers between schools are all disturbing conditions in school data which must be critically appraised to derive acceptable intercensal population trends. Certain other bases for estimates have varying degrees of reliability.[7]

Estimates, either postcensal or intercensal, predicated upon previous decade increases employing straight line arithmetic projection are frequently in gross error as was exemplified by the Bureau of Census postcensal estimates for large cities between 1920 and 1930. The Pearl-Reed Logistic method, employing a biological theory, was found wanting when applied to the urban or metropolitan population of Los Angeles, principally because natural increases have been a minor proportion of the total growth, while immigration has been the dominant part.

FAMILY CAPACITY METHOD

This method was developed fourteen years ago by the author in making estimates and forecasting the population of Los Angeles City.[8] The first study was published in October, 1923 in the Bulletins entitled "Los Angeles Business Statistics" which preceded the "Eberle and Riggleman Economic Service" published beginning September 1, 1924.[9] The initial details of this method were as follows: The number of permanent families within the city was ascertained from the census of 1920. Family capacities occupied by nonpermanent families and those vacant, based upon private surveys, were added, together with the dwelling units under construction on January 1, 1920. This completed the ascertainment of total permanent and nonpermanent family capacities. According to the official building permits the succeeding monthly family capacities provided, minus demolitions, were added up to the

[6] Erle F. Young omitted to take the nonpermanent population into account in his review of meth ods estimating population for dynamic communities, *American Journal of Sociology* 38: 577, Jan. 1933.

[7] Postcensal population estimates based upon net gain of births, deaths, immigration and emigration, while applicable to national estimates, are difficult to apply to localities, due to the uncertainties of ascertaining net immigration. Combinations of monetary, physical or natural unit estimates are of doubtful value because extreme bias of one unit may jeopardize accuracy. An estimate of adults based upon city directory listings, supplemented by children derived from school enrollment, and indirect use of births, was found better than school data or directory estimate alone. (See *The Annals of The American Academy of Political and Social Science*, Nov. 1936, pp. 167–176). Studies by the author of combinations of units, or averages of the same unit for various cities, have generally been found unsatisfactory. Rather, population growth should be measured comparatively by single units for each city or study area in accordance with the characteristics of its population and the availability and adaptability of specific data.

[8] John R. Riggleman collaborated in the development of this method.

[9] The Service was later published as the "Eberle Economic Service" and discontinued September 1935.

desired date of estimate. The vacant family capacities and dwelling units under construction at the date of estimate were determined and deducted from the total cumulative family units. This resulted then in the total family capacities permanent and nonpermanent which were occupied. According to sample field survey estimates, the nonpermanent families were deducted to obtain the net total permanent families which in turn were multiplied by the persons per family as indicated by census enumerations and private investigation, and adjusted for trend. Finally, the populations of all annexations since the date of the census were added. The result was the total number of permanent persons in the city at the desired date, which could be compared with the number of permanent persons enumerated at the date of the 1920 census with and without annexation. To obtain the total permanent and nonpermanent population for economic purposes the nonpermanent family capacities were changed to persons and added to the above figure resulting in the total number of permanent and nonpermanent classes of persons in the city including annexations.[10]

By this method in 1923 and 1924 a forecast was developed and published for Los Angeles City for 1930 of 1,250,000 persons which compared very favorably with the census on April 1, 1930, of 1,238,048. The progressive quarterly estimates of permanent population begun by this service in 1924 ultimately cumulated to 1,304,130 on April 1, 1930,[11] which would have been lower if adjusted for nonpermanents in annexations, and loss of family capacities destroyed by fire and converted into business units by the terrific building boom during the twenties, but there was no official record of these losses. With these adjustments and reductions the cumulated estimate at April 1, 1930, would have been quite comparable with the census.

The family capacity method incorporates many desirable features. Family capacity changes are closely related to population changes; the unit is secured from reliable official sources; it is not biased by fluctuations in business volume or prices; the data are legally confined

[10] Since the census of 1920 did not report private and institutional families separately, the family capacities based upon the 1920 census included these quasi families. Even adjusting the persons per family to a private family factor (basis 1900) and applying this factor to permanent family capacities occupied during the year of estimate resulted in a small error—due to the omission of permanents in hotels, clubs and other quasi family capacities constructed since the census year and not included with the official building department dwelling classification. Also an irregularity is caused by applying the persons per private family to the total permanent family capacities which included the census quasi families. To include all possible permanents and nonpermanents in the year of estimate the persons per family based upon both private and institutional families should be applied to the total permanent plus nonpermanent family capacities occupied including institutional family capacities.

[11] See *Eberle Economic Service*, Vol. VII, pp. 157–158, August 11, 1930; also September, November, 1923; January 1924; April 14, 1930.

to the city area, and the estimates of persons per family are based upon primary official sources available for decades. Quasi family capacities and doubling up of families in depressions are some of the sources of error but are of minor importance. Relative to the degree of accuracy the family capacity method has proven reasonable in cost.

CONCLUSIONS AND RECOMMENDATIONS

A high degree of accuracy can be obtained in making estimates and measuring changes of population, or related data, if there is definition, classification and qualification as indicated in the foregoing discussion. Only the kind or kinds of population should be used which fit the purpose. Monetary units as a basis of population estimates should be avoided. Unscientifically prepared population data may lead to the adoption of unsound policies resulting in waste of human effort, natural resources, and public and private funds. Physical and natural units are preferable because here they have greater stability and applicability.

Family capacities, families and persons per family should be given first preference. Family capacity source data should be refined to include quasi family capacities (hotels, lodging houses, etc.), and adjusted for losses caused by obsolescence, depreciation, fire, the elements, conversion, cancellation of permits, moving, etc., and those added by conversion, moving, alterations, etc. Generally, the probability of error appears to be less in estimates based upon family capacities and persons per family than in other estimates.

Utility meters and services should be given second preference, especially water and gas data. These should be refined to make them more adaptable for estimating urban population changes by including, as far as possible, only meters serving premises used for human habitat; by excluding inactive meters at the date of estimate; by sample checking vacancies in structures served by master meters and by other active meters, and by attention to persons in quasi family occupancies. Such refinements are not costly.

Estimates based upon elementary school data should be given third preference. These data should also be refined and adjusted as indicated previously to make them as representative of population growth as possible.

Finally, all estimates and forecasts should be checked and tested in the light of the absolute and relative growth by tabular and graphic analyses.

In reference to enumeration it would be very desirable and useful from the standpoint of local economic planning if the Bureau of the

Census in 1940 would include in the population schedule items to show the number of nonpermanent persons and traveling transients in at least the larger cities and metropolitan areas. The Bureau must practically cover the universe anyway to obtain the permanent population. This would provide a check for intercensal estimates of these classes of persons, and if repeated each decennial census would indicate trends not hitherto available. Besides, it would require the enumerators to be more discriminate and indirectly improve the accuracy of the count of permanent persons. Finally, the census officials must recognize the probability that, due to the increased mobility of our population, the application of the customary constitutional definition of permanent persons in taking the census may, for practical purposes, become progressively more untenable.

THE STANDARD DEVIATION OF SAMPLING FOR LIFE EXPECTANCY

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It has long been customary to take as the standard deviation of sampling for a death rate p per capita the formula $\sigma = \sqrt{pq/n}$ hwere n is the population on which the rate is based. In comparing rates this standard deviation is used to guide the judgment as to whether the samples are large enough so that the difference in the rates is more than might be expected to be due to random differences between samples. More recently much emphasis has been laid on the expectation of life at birth as an over-all index of mortality in a population and life tables have been computed for relatively small populations, particularly for the purpose of comparing the expectations of life at birth, $\mathring{e}_0$, in different populations or of comparing the life table death rates $(1000/\mathring{e}_0)$ per thousand or $1/\mathring{e}_0$ per capita. Such comparisons are generally made without reference to the corresponding standard deviations.

The expectation of life $\mathring{e}_x$ at age x is sometimes defined as the average duration of life beyond age x of a cohort l_x of persons starting together at age x. If $\mathring{e}_x$ were actually computed in accordance with this definition, the sampling error of $\mathring{e}_x$ would be the standard deviation of the frequency function d_y, $y \geqq x$, of deaths at ages from x on divided by the square root of the number l_x of persons involved.[1] But $\mathring{e}_x$ is never thus computed and the standard deviation of any estimate of a quantity has to be figured from the manner of estimation.

The expectation $\mathring{e}_x$ at any age x is actually deduced by a mathematical calculation from the age specific death rates; by definition it is the average number of years lived after age x by a group of l_x persons alive at age x, i.e., $l_x\mathring{e}_x$ is the total number of years lived by the cohort l_x. Now, if in some particular age group y to $y+h$, subsequent to age x, the value of q_y, the chance of dying between those ages, should perchance be increased by δq_y, the number of deaths would be increased by $l_y\delta q_y$ and the years lived would be diminished in that age interval

[1] The standard error $\sigma(\mathring{e}_x)$ may perhaps be roughly estimated as the standard deviation $\sigma(d_y)$, $y \geqq x$, of the d_y curve taken from the computed life table divided by the square root of the total number of deaths D above the age x which went into the calculation of the life table, but this estimate has been found somewhat unreliable; we should probably do better to use for D the life table death rate times the population.

by $\frac{1}{2}hl_y\delta q_y$ and in all ages above $y+h$ by $l_y\mathring{e}_{y+h}\delta q_y$. Thus the expectation of life $\mathring{e}_x$ would be changed by

$$\delta\mathring{e}_x = -\, l_y(\mathring{e}_{y+h} + \tfrac{1}{2}h)\delta q_y/l_x. \tag{1}$$

To a first order of approximation, regarding δq as infinitesimal, the total change in $\mathring{e}_x$ from variations δq in different age groups would be the sum of the individual changes, viz.,

$$\delta\mathring{e}_x = -\sum_{y\geqq x}\left(\frac{l_y}{l_x}\right)(\mathring{e}_{y+h} + \tfrac{1}{2}h)\delta q_y \tag{2}$$

where the summation extends over all intervals h, not necessarily equal, from age x on to the end of the life table. As the variations δq are supposed to be those of random sampling they must be assumed to be uncorrelated and the square of the standard deviation of $\mathring{e}_x$ is therefore

$$\sigma^2(\mathring{e}_x) = \sum_{y\geqq x}\left(\frac{l_y}{l_x}\right)^2(\mathring{e}_{y+h} + \tfrac{1}{2}h)^2\sigma^2(q_y) \tag{3}$$

In getting the formula it has been assumed that the deaths were spread uniformly over the interval x to $x+h$; for some intervals such as "under 1" or "under 5" this might not be so satisfactory as to assume that the average period lived during the interval was ch instead of $\frac{1}{2}h$. Moreover it often happens that deaths or populations at the older ages are available only in a wide group such as "75 and up"; in this case it may perhaps be assumed[2] that

$$\mathring{e}_{75} = \frac{1}{m_{75}}, \quad \delta\mathring{e}_{75} = -\frac{l_{75}}{l_x}\frac{\delta m_{75}}{m^2_{75}}, \quad \sigma^2 m_{75} = \frac{m_{75}(1 - m_{75})}{n_{75}} \tag{4}$$

where m_{75} is the rate of mortality per capita for ages 75 and up and n_{75} is the population 75 years of age and older. With respect to σ_q^2 except in the last interval we have[3]

$$q = m\Big/\left(\frac{1}{2}m + \frac{1}{h}\right), \quad \frac{1}{q} = \frac{1}{2} + \frac{1}{hm} \quad \text{or} \quad 1 - c + \frac{1}{hm}, \tag{5}$$

[2] The final term in (2) would become meaningless, since for the last interval q_y is 1, $\mathring{e}_{y+h}$ is 0 and $\frac{1}{2}h$ will not do for the average years lived. The assumption in (4) is that the distribution in the last interval is stationary.

[3] If q were estimated directly as the probability which it is, its standard deviation would be the square root of $q(1-q)/n$ but as q is estimated from m it is necessary to follow its method of estimation.

provided we use ch in place of $\frac{1}{2}h$ for the average life of those who die in the interval. Then

$$\frac{\delta q}{q^2} = \frac{1}{h}\,\frac{\delta m}{m^2} \quad \text{and} \quad \sigma^2(q_y) = h^2\left(\frac{q_y}{hm_y}\right)^4 \frac{m_y(1-m_y)}{n_y}. \tag{6}$$

In the particular group "under 1", q_0 is generally taken as the infant mortality per capita and $\sigma^2(q_0) = q_0(1-q_0)/B$ where B is the number of births on which the infant mortality q_0 is based. In case we compute rates from average deaths for k years, the populations n_y or B are to be multiplied by k.

Thus $\sigma^2(\mathring{e}_x)$ may be computed from the data for the life table and from the entries in it. An example of the computation of $\sigma^2(\mathring{e}_0)$ follows:[4]

ONONDAGA COUNTY, N.Y., 1929–1931, AVERAGE DEATHS

Age	Deaths	Population	m_x^{x+h}	l_x	q_x	$\mathring{e}_x$
<5	355	23,800	.01492	1000	.0701	61.7
5–14	76	51,900	.001464	930	.0145	61.3
15–24	104	47,400	.002194	916	.0217	52.1
25–44	395	91,500	.004317	896	.0828	43.2
45–64	1002	58,400	.01716	822	.2930	26.2
65+	1468	18,900	.07773	581	—	12.9

We take $c = .14$ for the first group. Then

Age	l_x/l_0	$\mathring{e}_{x+h}+ch$	Prod.	10^{-4}(Prod.)^2	$10^4\sigma^2(q)$	Prod.
<5	1.000	62.0	62.0	.3844	.0401	.0154
5–14	.930	57.1	53.1	.2822	.0091	.0026
15–24	.916	48.2	44.1	.1949	.0148	.0029
25–44	.896	36.2	32.4	.1051	.0529	.0056
45–64	.822	22.9	18.8	.0353	.205	.0072
65+	.581	—	(96.2)	(.9259)	(.0126)	(.0117)

[4] Of course, a six interval life table is decidedly sketchy; but my colleague Dr. C. R. Doering, who has in preparation a considerable discussion of life tables from which this particular illustration is taken, finds that for many purposes such a method of calculation is adequate. See C. R. Doering and A. L. Forbes, *Proceedings Natl. Acad. Sci.*, 24 (1938), 400–405. On the basis of a thirteen interval life table for this same county, $\mathring{e}_0 = 61.3$ instead of 61.7 and $\sigma(\mathring{e}_0)$ is .200 instead of .213 as found here. It seems unnecessary for the present illustration to increase the detail by using a larger number of intervals than six.

where the terms in parenthesis in the last line are the special values needed for the last term.[5]

$$-\delta\mathring{e}_0 = 62.0\delta q_0 + 53.1\delta q_5 + 44.1\delta q_{15} + 32.4\delta q_{25} + 18.8\delta q_{45} + 96.2\delta m_{65} \qquad (7)$$

$$\sigma^2(\mathring{e}_0) = .0154 + .0026 + .0029 + .0056 + .0072 + .0117 = .0454$$

Hence $\sigma(\mathring{e}_0) = .213, \quad \mathring{e}_0 = 61.7 \pm .213 = 61.7(1 \pm .00345)$

and $1000/\mathring{e}_0 = 16.21(1 \pm .00345) = 16.21 \pm .056.$

Although it is a little to one side of the matter of $\sigma^2(\mathring{e}_x)$ one may remark that (2), with the proper last term taken from (4) and with the term $\frac{1}{2}h$ replaced by ch for the first interval, gives a value of $\delta(\mathring{e}_0)$ for any changes in the age specific death rates. The value like that for $\sigma^2(\mathring{e}_0)$ based upon it must be considered approximate because through the work it has been assumed that δq is infinitesimal and that infinitesimal effects are additive since infinitesimals of higher order are neglected. A test of (2) for the above table may be made from (7) if we assume that the values of the mortality rates m are all increased or decreased by 10 per cent. From (7) by computing the δq's one finds that $\delta\mathring{e}_0$ is -2.04 or 2.06 respectively on the two assumptions of increase and decrease. A direct calculation of the life tables from the changed rates gives the values -1.95 and 2.23 for $\delta\mathring{e}_0$ to which those obtained from (7) may seem sufficiently near.[6]

[5] Namely, $(l_{65}/l_0 m^2_{65})$, the square of this $\times 10^{-4}$, $10^4\sigma^2(m_{65})$, and the product of the last two.

[6] The analysis of the standard error of a life table applies of course only to the method of direct calculation from the raw data as developed by Dr. Doering and Miss Forbes. Life tables are usually computed only after smoothing the data. How much such processes do toward affecting the values of $\mathring{e}_x$ is an interesting question. For small districts the effect would probably be less than the sampling error, for large districts it might be greater. In any case that method of calculation would have to have its own sampling error properly determined. Finally it may be remarked that only pure chance variation has been admitted in the age specific death rates, whereas it is well known that the actual variations in them which remain unexplained and cannot be corrected for are larger than those due to chance and are not uncorrelated as between the different age groups. The fluctuations which occur in $\mathring{e}_x$ from no as yet assignable causes are probably what the practical statistician might well call chance variations. To study them in a search for their causes it is desirable to have an easy method of calculating life tables and some fairly satisfactory estimate of the sampling error of $\mathring{e}_x$.

NOTES

MEASURES OF CHANGES IN FERTILITY IN GERMANY[1]

The rapid decline of birth rates below the levels necessary for permanent population replacement has focused attention on the possibilities of direct governmental action in stimulating a rise, or at least avoiding further decline. The changes in the German birth rate are of especial interest. In 1933, it was 14.7, and the net reproduction rate was .70; in 1936 the birth rate had increased to 19.0 and the net reproduction rate to .89, which is significantly above the 1933 level.[2] The total number of live births was 971,000 in 1933; 1,198,000 in 1934; 1,264,000 in 1935; and 1,279,000 in 1936. This increase in the four-year period amounted to 32 per cent.

Naturally there was considerable interest, both within and without Germany, in evaluating the effectiveness of the various governmental programs intended to stimulate a rise in the birth rate. The Statistisches Reichsamt has greatly expanded the scope of its vital statistics in order to estimate quantitatively the extent to which the increased number of births is due to the increase in marriages and hence is only transitory. Dr. Friedrich Burgdörfer, director of the population section of this Bureau, concluded from an analysis of these data that the number of births in Germany during 1934–36 was greater by 900,000 than would have been expected had the number of marriages remained at the 1932 level and the fertility rate continued at the 1933 level; approximately 300,000 or one-third of this increase can be attributed to an increase in the number of marriages; and the remaining 600,000 or two-thirds of the total, is to be attributed to a true increase in marital fertility.

The basic materials for Burgdörfer's studies were secured through a combination of census data, birth and death registrations, and records of marriage and divorce. The Census of 1933 was the first German one to secure detailed information on marital fertility.[3] In the tabulations of that census, married women were classified accord-

[1] The material in this note is based on two articles by Dr. Friedrich Burgdörfer: "Familienstatistik und Fruchtbarkeitsmessung. Neue Aufgaben und neue Wege der deutschen Bevölkerungsstatistik." *Revue de l'Institut International de Statistique* 5(3): 212–226. Oct. 1937, and "Die neue deutsche Bevölkerungsentwicklung im gesamteuropäischen Rahmen mit besonderer Berücksichtigung der zahlenmassig erfassbaren Auswirkungen bevölkerungspolitischer Massnahmen." *Archiv für Bevölkerungswissenschaft (Volkskunde) und Bevölkerungspolitik*, 7(5/6): 321–347. Nov. and Dec., 1937.

For a description of the fertility data of the 1933 Census see Heinel, Eberhard, "Die familienstatistischen Ermittlungen bei der letzten Volkszählung." *Archiv für Bevölkerungswissenschaft (Volkskunde) und Bevölkerungspolitik*, 7(5/6): 321–347. Nov., and Dec., 1937.

[2] *Population Index*, 4(2): 128. April, 1938.

[3] *Statistik des Deutschen Reichs*. Vol. 452, No. 1.

ing to year of marriage by single years 1913 to 1933, and for the years 1908–1912 and 1907 or before.

Detailed tables were presented giving married women by year of marriage, year of birth, and number of children born, for various regions and minor areas, and by religious affiliation, social status, amount of land, ownership of land for agricultural and non-agricultural populations, and gainful employment of married women.

For the purpose of Dr. Burgdörfer's computations, it was possible to secure from the 1933 Census basic information concerning the distribution of married women by age and duration of marriage. However, the current tabulation of the fertility of married women by age and duration of marriage required an expansion of the information collected on births, deaths, marriages and divorces. Therefore, the number of legitimate births is now regularly tabulated by order of birth, age of mother and duration of marriage. Furthermore, the number of women married in each year is tabulated by year of birth. For marriages dissolved by death or divorce, information is secured to show year of marriage, year of birth of the woman and number of children born to that marriage.[4] Beginning with 1933, vital statistics were tabulated by usual residence.

On the basis of these data the number of married women by age and duration of marriage can be computed annually. The number of legitimate births, classified by order of birth during the year is related to this base, and the resulting rates permit detailed annual comparisons.

Table I illustrates the type of data available and shows some typical results. With few exceptions the values in 1934 and 1935 exceeded the values in 1933 and those for 1935 exceeded those for 1934. The increases extended to the several birth orders and to marriages which had been in existence long before 1933, as well as those contracted since that time. The more detailed table from which items in Table I were excerpted similarly shows increases for nearly every birth order and grouping by duration of marriage. The greatest increase occurred in those marriages which had existed between 3–13 years. Among them the increases ranged from 33–49 per cent. The increase among marriages which had lasted less than 4 years was less pronounced. This is attributed to the fact that fertility is comparatively high in the first years of married life, even during a time when fertility rates in general are at a very low level. The major contribution of the marriages since 1933 to the total number of births is therefore due to the increase in the number of marriages.

[4] For the tabulations for 1933 and 1934 see Vol. 495, *Statistik des Deutschen Reichs*, Part 2.

TABLE I

MARITAL FERTILITY IN GERMANY, 1933–1935, FOR SELECTED YEARS

Year	Average duration of marriage in years	Year of marriage	Number of married women under 45 years of age on Jan. 1 of specified year	Number of legitimate births during specified year per 1,000 married women*						
				Total	Order of birth					
					1	2	3	4	5	6 and over
1933	1	1932	487	318.87	271.30	43.41	3.69	0.42	0.03	0.02
1934	1	1933	616	344.57	292.78	46.54	4.55	0.55	0.10	0.05
1935	1	1934	715	329.87	282.76	42.51	3.90	0.58	0.08	0.04
1933	7	1926	418	91.81	7.80	23.61	24.35	18.56	10.94	6.55
1934	7	1927	469	117.76	11.94	35.87	31.48	20.60	11.13	6.74
1935	7	1928	515	124.54	13.79	40.51	33.16	20.26	10.57	6.25
1933	13	1920	628	40.58	0.87	3.28	6.06	6.90	6.48	16.99
1934	13	1921	509	49.69	1.20	5.00	8.91	9.00	7.71	17.87
1935	13	1922	487	53.94	1.66	7.20	10.90	9.77	7.85	16.56

* Includes illegitimate children subsequently legitimatized through marriage.

Burgdörfer estimates the number of births expected if the number of marriages and the fertility rates had remained constant until 1936, in order to secure a quantitative estimate of the births which can be attributed to the increased number of marriages. The number of marriages in 1932 was taken as the base, and it was assumed that the same number of marriages occurred in each of the succeeding years. This number of newly married women was added to the totals found by the 1933 Census, and deductions made for marriages dissolved through death or divorce. The fertility rates reported during 1933 were applied each year to the computed number of married women classified by age and duration of marriage. This "expected" number of births is thus based on the assumptions: (1) that the number of marriages in each year remained at the same low level as in 1932, and (2) that the specific fertility rates continued at the low level of 1933. By applying these fertility ratios to the increased number of marriages contracted during 1933 and each of the subsequent years, it was possible to compute the number of births "expected" from the increased number of marriages, assuming that fertility rates remained at the 1933 level. The difference between the sum of these "expected" values and the actual number of births which occurred is attributed to a true increase in fertility, i.e., due to factors other than the increase in the number of marriages.

The figures for 1933–1936 are given in Table II, where column 1 shows for each year the "expected" number of births to women who

were married before January 1, 1933, plus those married since as computed according to the assumptions stated above. Columns 2–5 show the number of children "expected" as a result of the marriages contracted in 1933–1936 in excess of the number contracted in 1932. For example, the number of marriages in 1932 was 517,000; in 1933 it was 639,000 and the difference is 122,000. It is the latter figure which is used in computing the values in column 2. Column 7 gives the actual number of legitimate births occurring in each year. Column 6 is the difference between column 7 and the sums of columns 1–5. It is the increase in the number of births which is credited to a true rise in fertility.

TABLE II

THE INCREASE IN BIRTHS IN GERMANY* ALLOCATED TO INCREASED FERTILITY AND THE INCREASE IN THE NUMBER OF MARRIAGES, 1933–1936

Year	Base figure	Legitimate births†						Illegitimate births	Grand total
		The increase in number of births due to—					Total number of births		
		the increased number of marriages in				increased fertility			
		1933	1934	1935	1936				
	1	2	3	4	5	6	7	8	9
1933	861,500	17,400	—	—	—	—	878,900	106,200	985,100
1934	858,700	37,800	32,100	—	—	181,500	1,110,100	104,800	1,214,900
1935	854,000	25,200	69,000	19,000	—	211,000	1,178,200	101,200	1,279,400
1936§	851,500	19,700	46,000	40,600	13,400	220,000	1,191,200	101,200	1,292,400

* Excluding the Saar.
† Including stillbirths.
§ Preliminary.

A complete quantitative evaluation of the various factors involved in this increase in fertility has not been attempted. Burgdörfer finds that during 1933–1935 couples who were granted marriage loans had a fertility rate 47 per cent greater than that among couples who had not been awarded such loans. He points out, however, that this differential may not be maintained permanently and that there may be selective factors, such as age and social class, which require further analysis before the full significance of the differences can be determined. As further data become available it may become possible to isolate some of the other factors which are involved in the changes in German fertility rates.

CONRAD AND IRENE B. TAEUBER

Washington, D. C.

A MECHANICAL INTENSITY SHADING MAP

The preparation of statistical maps of the United States illustrating comparative conditions of density by states, such as population per square mile, per capita automobile registration, percentage distributions of various economic and sociological phenomena, etc., by means of varying intensity shadings consumes eight hours and more, depending on the skill of the draftsman and on the type of shading used.

In order to reduce the time required for the preparation of maps of this type, the writer recently proposed and drew up specifications for a *mechanical* intensity shading map which is based on the very simple principle of the jig saw puzzle.

The device is constructed of aluminum and consists of a "base" and a cover. There are 6 sets of different shadings or "state pieces" for each of the 48 states, and the District of Columbia. To the aluminum "base" a skeleton grid of the map, consisting of the compartments for receiving the "state pieces," is fastened. The "state pieces" are interchangeable and fit snugly into the 48 "state compartments," allowing one to make up any desired combination.

It was found convenient and efficient to file the "state pieces" in a flat box provided with 48 individual sections resembling roughly the map of the United States. The time required to place the various "state pieces" into the "state compartments" does not exceed 15 minutes. The title and legend are prepared on strips of paper and are held in place with a light coat of rubber cement on the surface of the map. The frame with the glass plate is placed over the assembled map which is then ready to be photostated or photographed. The total time for completion of a map required approximately one hour.

The results obtained have been most satisfactory and the maps produced have a uniform appearance and cannot be distinguished from a regular drafting job. The principle of the device can obviously be extended to state maps by counties where the number of counties is not too large. The device was constructed by the Works Progress Administration.

R. VON HUHN

Works Progress Administration

THE NEW SYSTEM OF POPULATION ACCOUNTING IN THE NETHERLANDS

In the *Journal of the American Statistical Association* of December 1936, vol. 31, pp. 719–722, I stated that the new family-individual-card-index system has been tried successfully since 1930 in a number of communes of divergent types. After this number of communes had gradually risen to about 400 communes, embracing ⅓ of the entire population, it was decided in 1938 by the Netherlands Government, on the suggestion of the Central

Statistical Bureau, to introduce this system in all communes before the census of population of 1940.

As a basis for the census, the family-individual-card-index system causes such a saving in the sum which the census would cost if the system followed in 1930 were applied that the cost of the introduction of the new system can be wholly defrayed by it.

Once the card for an individual is filled in with authentic data, it is never copied out again but in its original form, supplemented with a number of details noted in the course of the life of the inhabitant and transferred from one commune to another, it follows him from the cradle to the grave. On his decease, the cause of death is noted on the card which then, with all its data of demographic interest, can be used for statistical investigations. Besides the annotations which are exclusively necessary for administrative purposes, scientific data will be recorded on a supplementary card, concerning, for example, education received, examinations passed, special talent for art, science, politics, technical science, etc.; physical disabilities, idiocy, lunacy, alcoholic excess, hereditary diseases, feeding during the first year of life, etc.

The system opens up wide perspectives for simplification of municipal administration and at the same time for social research. On behalf of science, a Demographic and Genealogical Archive is being gradually created of great importance.

H. W. METHORST

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DR. WARBURTON'S REVIEW OF *National Income and Capital Formation*—A COMMENT

Dr. Warburton's review[1] brings to the attention of readers the extent to which discussion and measurement of a single concept of national income involve a definite stand on many controversial issues in economic theory and social philosophy. It also illustrates the temptation to take a categorical position on these issues and damn with fine dogmatic zeal those who recalcitrantly view them from a somewhat different angle.

It is neither possible nor useful to consume the space of this JOURNAL in a prolonged discussion of the theoretical, factual, and terminological questions raised in the review. To provide facilities for such a discussion, both oral and in print, is one of the aims of the Conference on Research in National Income and Wealth. But I should like to state here as briefly as possible my answers to Dr. Warburton's critical observations.

1. The reviewer expresses regret that "national product" and "national income" are used to designate a sum of values, whereas "national product" would be "an especially descriptive and apt term" to designate the "congeries of specific commodities and services resulting from economic activity"

[1] See this JOURNAL, September 1938, pp. 630–7.

(p. 631). But the term "national product" conveys the idea of a comprehensive measure of the results of the nation's economic activity; and such a comprehensive total is not and cannot be identical with any heap of specific commodities and services. If *net* national product is meant, then in addition to finished consumers' goods, one must include changes in inventories, in stocks of durable equipment, and in claims against foreign countries—items that cannot be resolved into a congeries of specific goods. If some of the various possible concepts of *gross* national product are meant, a more specific designation is needed; and most of the corresponding totals cannot be confined to a congeries of complete commodities and services. The total that Dr. Warburton seems to have in mind is perhaps best described by the term "total output of finished consumers' goods" or "total output of finished consumers' goods and durable productive equipment."

2. Dr. Warburton must well know that the national income totals as measured in the studies of the National Bureau of Economic Research, as well as those of the Department of Commerce, the National Industrial Conference Board, and all agencies that publish continuous estimates for this country, are derived by aggregating income payments to individuals and net savings of enterprises. The ambiguity in our statement of the method, alleged in the last paragraph on p. 631 of the review is thus a forced misconstruction of a single sentence.

3. The reviewer thinks that data regarding the value of services not embodied in new commodities are sufficiently plentiful and reliable to permit the preparation of continuous estimates of national income by the "final products" method and, indeed, designates as "sheer nonsense" my statement to the contrary. This is an evaluation of the existing supply of data in terms of the needs of a national income estimate; and every investigator in the field is entitled to his judgment. Strangely, however, the agencies mentioned under point 2 insist on the method of aggregating income payments and net savings. My personal opinion, based on experience with both methods, is that the aggregation of the value of final products yields the less reliable results, even when confined to commodities; and it is largely for this reason that the comparison of measures resulting from the capital formation study with those from the national income study had to be carried through in terms of three-year averages. As to services not embodied in new commodities, the data are far less adequate than for commodities, even for any single year.

4. The national income total as measured is confined largely to the product of activities whose results appear on the market. But not all activities whose results appear on the market can be considered productive of utilities or economic goods. This exclusion of marketable non-goods was sufficiently stressed in the report to prevent misunderstanding. As to products retained by farmers and net services of houses owned, the connection with the market referred to in the quotation on p. 632 of Dr. Warburton's review appeared to be sufficiently close to warrant inclusion. Aside from the question of

terminology, Dr. Warburton finds this procedure deficient in two principal aspects: first, the treatment of income derived from alcoholic beverages during Prohibition, and second, the treatment of income represented by services rendered by government.

5. Since as stated in *National Income and Capital Formation* (p. 6), it was impossible to exclude the activities of producing materials part of which was used for illegal purposes, the "inconsistency" in the estimates introduced by the repeal of Prohibition, although undoubtedly present, is perhaps not as great as Dr. Warburton suggests. But this "inconsistency" results from changes in the overtly expressed social judgment as to what is and is not productive. It could be avoided only by adopting strictly articulated criteria of productivity, to be determined by the estimator. This would be an exceedingly interesting experiment and has been urged by me in a discussion of Dr. Copeland's report in the *Income Conference Studies*, Vol. I (pp. 36–7). But the practical difficulties of carrying through this experiment can easily be imagined.

6. The treatment of income originating in government activity has been subject to extensive discussion in the first volume of the Conference studies, already referred to; and in the second volume, to appear by the end of this year. Readers interested in the problem should consult these publications for statements of conflicting positions. The viewpoint which we followed is that the principle governing the estimate of the net value of government activities should be the same as that applied to the activities performed under the aegis of the business system: namely, that the value of any good is measured by the price which it fetches on the market or the money paid for it. Hence, the evaluation of government activities is in terms of payments made for them, not in terms of their costs. A corollary and essential point in our treatment is that, for the bulk of government activities we do not consider it feasible to distinguish between services to individuals and services to the business system (and hence measure the value of free services rendered by governments to the body of ultimate consumers as a whole).

7. In analysing more specifically Dr. Warburton's critical treatment of our measurement of income originating in government activity, we begin with the case of a cosmetics industry before and after the tax. This case proves little, because it takes for granted, for the special case of teachers' services, the assumption which, as just stated, we hold to be invalid for most government services: that it is feasible to segregate the services of governments to ultimate consumers from those to business. It is this assumption that permits Dr. Warburton to assign the price of 0 to services of teachers, and derive in the fourth column of his illustrative table an index descriptive of retail prices for the total volume of finished products (i.e., cosmetics and teachers' services). Our position is that for most government activities the distinction between services to consumers and to business enterprises is inherently arbitrary; that even in the limited cases where the

activities appear on the surface to be for the exclusive benefit of either consumers or business (as, e.g., in education provided by the state), further scrutiny reveals a mixture of services to two masters; and that for the specifically governmental activities (defense, regulation, communication, public construction, etc.) the mixture of services to the business system and to ultimate consumers can be resolved only with the help of assumptions so arbitrary as to make the results almost worthless. It is not claimed that the position here stated and adopted by us is free from arbitrariness and compromise; but it involves much less of these elements than the approach that requires the segregation of government services to consumers from those to producers. At any rate, the construction of conundrums based on a selected group of government activities that, on the surface, appear to be services to consumers only, hardly provides a serious argument against our position.

8. Hence Dr. Warburton's illustrative example, presented by him as a demonstration of our position and of its absurdity, is inconsistent with the general viewpoint followed in our measurement of the net value of government services. From that viewpoint, it is not practicable to separate from government services as a whole final products flowing to ultimate consumers; and then to include their price in the index of retail prices. Indeed, the example represents a combination of Dr. Warburton's thesis that it is feasible to segregate services of government to ultimate consumers from those to business, with our position that government services should be evaluated at the prices paid for them, in the form of taxes by individuals and business enterprises.

9. Dr. Warburton is surprised at the results of treating income originating in government activity at prices paid for them, not at their cost,—with special application to the estimates for 1919, 1920, 1930 and 1932. The effect of such treatment is naturally to reduce the value of government activity whenever borrowed funds are used for purposes that lead to no increase in the government's tangible assets, as was the case in 1919 but not in 1920, in 1932 but not in 1930. (Some part of the difference in the former two years is due to crudities in adjusting fiscal to calendar years.) But why should we not take account of the fact that governments can consume a great deal more than what the citizens are willing to pay for government services, and consume it in uses that do not add to government assets? The only objection that might be raised against such treatment is that the government's wasteful activity should be charged not to government proper, but to the nation as a whole. But such an objection would be a qualification upon the propriety of segregating government as a branch of the economic system, similar to other branches. It refers to the *interpretation* of the estimates, not to the basis of evaluation. So long as we add income originating in government to income originating in other parts of the system, the basis of its evaluation should be consistent with the evaluation of the other parts. Dr. Warburton's argument as to borrowing against future tax collecting capacity appears to

me irrelevant, since he does not propose to apply this argument to any dissipation of borrowed funds by business enterprises in the expectation of profiting from the paying capacity of future would-be customers.

10. The Bureau of Labor Statistics index of the cost of living was applied, for "deflating" purposes, to consumers' outlay, the latter exclusive of expenditures on the acquisition of passenger cars. Consumers' outlay includes, by implication, direct payments by consumers to government. Prices of government services to consumers are not included in the cost of living index; nor, in accordance with our viewpoint, is it feasible to compute them. To the extent of this failure of coverage, the application of the cost of living index to consumers' outlay is not justified. But it is similarly not justified in application to any share of consumers' outlay spent on products whose prices have not been included or weighted properly in the cost of living index. It is for this reason that we considered the adjustment attained by the application of that index a crude approximation, and made an explicit statement to that effect in the report (p. 10). But we thought such a crude adjustment preferable to leaving the totals in current prices, fully subject to the effects of changing price levels.

11. Dr. Warburton's preference for the term "undistributed income" or "undistributed earnings," as compared with the term "net savings" may be understood. But the former pair of terms has defects not inherent in the latter. Income and earnings must be understood as net, and there is considerable ambiguity in the terms "net earning" and "net income" (before or after tax? inclusive or exclusive of depreciation charges? etc.). On the other hand, it must be noted that the term "net savings" was introduced by us in 1934, before the fury of the Keynesian controversy served to obfuscate its meaning. It did not appear wise to change the term, since its exact meaning was clearly described and adhered to.

In closing, I should like to express a feeling of satisfaction at seeing the issues in national income theory, terminology, and measurement brought in Dr. Warburton's review to the attention of a wider group of students. But this feeling is greatly damped by the categorical character of the reviewer's statements and his inability to see the issues in their ramifications. Surely Dr. Warburton is aware of the controversial character of the issues; of the validity of various viewpoints, especially with reference to the various purposes that may be served by national income measures. It is because of this variety of valid viewpoints that *National Income and Capital Formation* presents separate measures of different parts and of different variants of the national total. The attempt has been made to allow students with different approaches or diverse purposes in mind, Dr. Warburton among them, to construct the particular total or allocation they may desire. The reviewer's inclination to manifest great surprise at statements expressing viewpoints different from his own and at statistical results that seem strange to him, appears to stem from the attitude that in national income analysis and measurement one's theoretical viewpoint and expectations concerning the

behavior of statistical results should not be disturbed by a different approach or by too "logical" a pursuit of its assumptions. This attitude I can neither share nor approve.

SIMON KUZNETS

National Bureau of Economic Research

A REJOINDER

The National Bureau of Economic Research commands a high respect among social scientists. Economists and other persons interested in national income measurements have looked to the Bureau's extensive investigations for the most authoritative estimates in this field. Those estimates will be used for many different purposes by many different persons. Under these circumstances it seemed to be the duty of a reviewer to call attention to the fact that the published results of the Bureau's investigations will inadequately serve some of the purposes for which the estimates are desired and have been obtained in part by methods which have been seriously questioned by other students of national income.

Dr. Kuznets is to be commended for attempting to present his estimates so as to allow students with different approaches or diverse purposes in mind to construct a particular total or allocation they may desire. This has not been done, however, in the case of the two items on which I expressed doubt about the year-to-year comparability of his results. In regard to alcoholic beverages Dr. Kuznets has not published his estimates of their cost to consumers nor his estimates of the income derived from their production and sale for the years in which he includes this industry in his totals. Students who believe that more comparable year-to-year figures are obtained by excluding or by including this industry for all years than by including it only during the years when it was legal are not able to construct the totals they desire.

The problem of evaluating governmental services has received careful consideration by participants in the Conference on Research in National Income and Wealth.[1] The participants in this discussion have almost unanimously supported the cost basis. They have recognized that this method involves the arbitrary allocation of certain governmental services to consumers and to business enterprises but have nevertheless considered the cost basis of evaluation to be superior to or equally valid with the direct tax basis. In *National Income and Capital Formation* no mention is made of the possibility that use of the cost basis might appreciably affect the national income totals. In this case also it is not possible for other students to con-

[1] Specific reference is made here to papers by Morris A. Copeland, Gerhard Colm, and the writer, published in *Studies in Wealth and Income*, Volume One, and by Lauchlin Currie, Gardiner C. Means, Robert Nathan, Richard W. Nelson, and Donald Jackson to be published in Volume Two, and to comments on these papers. Some of these papers have been presented to the Conference on Research since *National Income and Capital Formation* was written, but Dr. Kuznets must have been aware, at the time when that volume was under preparation, of the major issues discussed in them.

struct the totals they desire by substituting their own estimates of the cost of governmental services for Dr. Kuznets' estimates of the payment for them.[2] Dr. Kuznets has not published his estimates of taxes collected directly from consumers.

Dr. Kuznets avoids an estimation of the cost of governmental services to consumers by assuming that the "price" of such services (that is, amount of direct taxes collected relative to the volume of the services) varies from year to year in a manner similar to the cost of living index. This same assumption, he points out, is made with respect to any consumers' outlay on products whose prices have not been included or weighted properly in the cost of living index. Whether a cost of living index may appropriately be used as a "deflator" is a problem of judgment as to the reasonableness of this assumption. In the case of governmental services, this assumption seems to me clearly untenable. The amounts involved are too large for dismissal of the error as negligible.

Dr. Kuznets' comments on my remarks relating to government borrowings indicate that I did not make clear the nature of the question I raised. For this reason, I would like to introduce a new hypothetical illustration which bears a close analogy to certain actual changes in tax and borrowing policy during the period covered by Dr. Kuznets' estimates. Suppose that in one year the government furnishes to consumers services which cost four billion dollars and meets this cost by collection of that amount of taxes directly from consumers. The next year the government furnishes the same services at the same cost, but collects only half the amount in taxes. The other half of the cost is met by borrowing from its citizens instead of taxing them. Non-governmental production, prices and income payments are unchanged. Yet the actual income received by individuals in connection with government activity, whether thought of as the salaries and wages they drew from the government payroll or as the services they received from the government, is unchanged. The total output of goods and services is unchanged. Further, if balance sheet changes are inspected, the reduction in the net assets of the government (its increase in indebtedness) is offset by an increase in the net assets of individuals. Yet, Dr. Kuznets' estimate of income originating in government—both in current prices and in "constant" prices—would be only one-half of that for the preceding year, and his estimate of the national income would be two billion dollars below that for the preceding year.

Also, I must have failed to make clear the real character of my objections (1) to Dr. Kuznets' use of the terms "net national product" and "national

[2] Dr. Kuznets' estimates of total salaries and wages drawn from government—which provide an approximate measure of the cost of all government services to consumers and to business—cannot be used for this purpose. When the problem under discussion is approached by the method of aggregating income payments, the "missing" element in Dr. Kuznets' estimate is the value of governmental services drawn in kind from government: that is, the value of governmental services to consumers (including capital formation in the form of streets, public buildings, etc.) in excess of taxes paid directly by individuals.

income" as synonyms, and (2) to his statement regarding basic methodology in national income measurements. I agree with him in using "national product" as a comprehensive term covering the results of the nation's economic activity, including changes in inventories, stocks of durable equipment and claims against foreign countries. I do not, however, approve the use of the term "national product," whether gross or net, as a sum of values. The "national product" includes the potatoes, the shoes, the machinery, and the other things we have produced during the year. This medley of commodities and services (including changes in ability to claim such products from abroad) is a reality. "National income," or the summation of their monetary value, is an abstraction. We should be at least as generous in providing concise terminology for the realities as for the abstractions.

In *National Income and Capital Formation* Dr. Kuznets explicitly states: "The available data render it *necessary* (italics mine) to estimate national income by . . . the aggregate of all incomes paid to individuals plus net savings of all enterprises." (p. 5.) He now meets my criticism of this sweeping assertion by stating his opinion that an estimate of national income obtained by aggregating the value of final products would be less reliable than an estimate obtained by aggregating income payments and net savings of enterprises. I did not express an opinion regarding the relative reliability of the totals obtained by the two methods. What I said is that the missing elements in the estimate by the method of aggregating final products, namely, the value of services not embodied in new commodities, can be estimated as reliably as some of the elements which Dr. Kuznets has necessarily used in aggregating income payments and net savings. I also expressed my belief that both methods should be used, being kept as independent as possible, and the results compared. This procedure would focus attention on some of the inadequacies of both types of estimates and would add considerably to our knowledge of annual variations in the national income, regardless of which method provides the more reliable total.

CLARK WARBURTON

Federal Deposit Insurance Corporation

AN INTERNATIONAL CONVENTION ON STATISTICS OF WAGES AND HOURS OF WORK

At the recent session of the International Labour Conference, at which 50 counties were represented, a draft Convention was adopted (by 125 votes to none against) dealing with the compilation of statistics of wages and hours of work. A preparatory technical Conference of Government Statisticians was held in September, 1937 in order to consider the scope and contents of such a Convention and the proposals which it made were adopted substantially by the International Labour Conference (which includes not only Government representatives but representatives of employers and workers).

The Convention is limited to the mining and manufacturing industries

(including building and construction) and to agriculture, and is also limited to wage earners. Thus, salaried employees and branches such as commerce are excluded. This is due to the special difficulties in compiling statistics for workers in these groups. Separate parts of the Convention deal respectively with (1) statistics of earnings and of hours actually worked in the mining and manufacturing industries; (2) statistics of wage-rates and of normal hours of work in these industries; and (3) statistics of wages and hours of work in agriculture. For mining and manufacturing industries, the statistics are to be compiled and published at least once a year, and in more detail particularly as regards sex and for adults and juveniles at least every three years. For agriculture, the provisions are more flexible and statistics of wages and hours are to be compiled at least once every two years.

In view of the preference in certain countries for statistics of rates over statistics of earnings, or vice versa, provision is made for countries to exclude from their ratification either the part dealing with earnings and hours worked or the part dealing with rates and normal hours, but not both; the part relating to agriculture may also be excluded.

The Convention also provides that it is not necessary to exercise compulsory powers, where such do not exist, and information need not be published which would disclose information relating to any particular establishment. The Convention comes into force twelve months after the date on which two countries have ratified it.

Reference should be made to the valuable assistance rendered in the preparation of this Convention by members of the American Statistical Association. Mr. Lubin, Commissioner of Labor Statistics, was the U. S. Government representative at the Preparatory Technical Conference of Government Statisticians, and Mr. Hinrichs, Chief Economist of the Bureau of Labor Statistics, was the Technical Adviser to the U. S. Government delegation to the International Labour Conference, and Chairman of the Drafting Committee of the Conference's Committee on Statistics of Wages and Hours of Work.

J. W. NIXON

International Labour Office
Geneva, Switzerland

PROGRESS OF WORK IN THE CENSUS BUREAU

CENSUS SURVEY OF BUSINESS

The Bureau of the Census is now publishing the results of a survey or sample census of retail and wholesale trade covering the year 1937 and the first half of the year 1938. This was a mail canvass, the main purpose of which was to provide indexes of change in these lines of business activity since the 1935 Census of Business. Like that census, the survey was financed from funds provided by the Works Progress Administration and was conducted in the city of Philadelphia by persons on relief rolls working under

the direction of officials of the Census Bureau. The mailing list was made up of stores reporting in the census of 1935, omitting those retail stores that reported annual sales below $5,000 and those wholesale stores that reported annual sales below $25,000. The items on the questionnaire included the net sales in each quarter of 1937 and in the first and second quarters in 1938; the total pay roll in 1937 and in the first half of 1938; and stocks on hand December 31, 1936, and December 31, 1937. The information covers identical establishments or, in other words, establishments that were included in the census of 1935 as well as in the survey of 1937–38. About 250,000 acceptable schedules were secured.

The Bureau has now (December 1) issued all the preliminary reports and expects to complete the final series by January 1. These reports, it is pointed out, are not designed to present a complete picture of the trade. The reporting was voluntary and many stores failed to cooperate or delayed their returns until beyond the closing date, July 1. The great value of the survey is in showing trends. The returns thus far received indicate considerable or large increases of sales between 1935 and 1937 followed by decreases in the first half of 1938 as compared with the first half of 1937.

COMPARABLE OCCUPATION STATISTICS, 1870 TO 1930

Because of changes in classifications and definitions, deficiences in the enumeration, and other reasons, the existing census statistics of occupations do not furnish a satisfactory basis for determining and measuring changes and trends in the occupational distribution of the nation's gainful workers. To remedy this situation the Bureau of the Census now has in preparation a report designed to present a consistent and comparable occupational classification covering the decennial censuses from 1870 to 1930 and corresponding as nearly as possible to the classification used in 1930. This involves more than a rearrangement or consolidation or breaking down of the occupation groups reported in the successive censuses. It is necessary to allow for the effect of such factors as changes in the instructions defining the term gainful worker, especially as applied to women and children; changes in the date of the census from June in 1900 to April in 1910, to January in 1920, and back to April in 1930; the early growth of occupations, such as that of "electrician," which were in existence for some time before they secured recognition in the census; the allocation of the comprehensive, indefinite group "laborers not specified" in earlier censuses to the several main divisions of occupations which are separately shown in the 1930 census—these and other factors necessitate making many estimates and readjustments in order to ensure comparability.

The work has reached the point where two press releases have been issued, one giving comparable statistics for the established ten main divisions of occupations in the Census classification, and the other giving a classification of gainful workers by age. The final report giving statistics in detail by occupations is well under way.

TRIAL CENSUS OF AGRICULTURE

With the cooperation of the United States Department of Agriculture the Bureau of the Census has conducted a trial census of agriculture in 90 counties distributed in 40 states and covering about 3,000 farms.

The State statisticians of the Department of Agriculture made the actual enumeration and forwarded the schedules to the Census Bureau for tabulation and analysis. They then made written reports to the Bureau upon all items of interest connected with the enumeration, including comments on the schedule questions themselves, the time required, reaction of the farmer to certain questions, the relative accuracy of replies obtained, the difficulty of obtaining certain information and other pertinent facts. These reports have been summarized by the Census staff so that all feasible improvements and suggestions may be adopted; and a series of press releases has been issued giving some of the interesting results brought out by a tabulation of the data.

The primary purpose of this census was to test out the proposed new questions for the agriculture census of 1940. Unforeseen difficulties are likely to arise in connection with any new census question, and the only real test of whether it can be answered satisfactorily by the census enumerators is actual field experience. The trial schedule included most of the satisfactory and necessary questions carried in the 1930 and 1935 censuses, as well as the new questions.

The Bureau is planning to conduct similar test censuses for population.

J. A. H.

STATISTICAL NEWS AND NOTES

Securities and Exchange Commission

As of July 1, 1938, most of the personnel and activities of the former Research Division were transferred to the Research and Statistics Section of the Trading and Exchange Division.

The first installment of the Commission's study of investment trusts and investment companies, which has been in preparation since early in 1936, was released on June 10, 1938. Up to the end of October the introductory Part One and the first five chapters of Part Two had been made available to the public. These chapters contain detailed statistical material, generally from 1927 through 1936, on the balance sheets and income accounts of investment trusts and companies, sales and repurchases of their own securities by investment trusts and companies, trading in the securities of these organizations on exchanges and the distribution of ownership of their own securities. The remaining statistical chapters covering mainly performance of investment trusts and companies and the nature of and changes in their security investments are expected to be released during the winter.

The analysis of the financial statements filed by approximately 2,000 corporations under the Securities Exchange Act of 1934, which has been undertaken under the Commission's supervision in the W. P. A. project "Census of Listed American Corporations," is nearing completion. It is expected that reports covering the years 1934 through 1937 will be released for about 30 major industries and for all companies included in the census. Releases are scheduled to start around the end of the year and to continue for about six months. The data to be released for each industry include combined balance sheets, profit and loss accounts and surplus reconciliation statements for each of the four years; volume of sales; selected asset and income relationships; list of parents and subsidiaries; detailed information on securities outstanding and certain information on remuneration of management.

Board of Governors of the Federal Reserve System

The *Federal Reserve Bulletin* for October 1938 contains a statistical analysis of branch banking in the United States at the end of 1937. This analysis includes the number of banking offices, the number of banks operating branches, and the number of branches, by class of banks, by location of branches relative to head office, and by States and geographic divisions. It also includes material relating to the size of banks operating branches, the population of towns or cities in which they are located, and the extensiveness of various branch systems. A revised historical table of branch banking, 1900–1937, is also included.

Farm Credit Administration

Effective October 1, 1938, a Division of Research was created in the Farm Credit Administration under the jurisdiction of Dr. E. A. Stokdyk, recently appointed Deputy Governor. Prior to this date, research was carried on by two units, the Economics Subdivision of the Division of Finance and Research, now the Division of Finance and Accounts, and the Research, Service, and Educational Subdivision of the Cooperative Division. These subdivisions have been transferred to the Division of Research and now carry the titles, Economics and Credit Research Subdivision and Cooperative Research and Service Subdivision. The former is engaged in research relating to the credit problems of farmers and the latter in research on problems of farmer's cooperative associations.

Bureau of Agricultural Economics

The changes in the structure of the United States Department of Agriculture announced by Secretary Wallace in the early part of October unify several lines of work in the Department and vitally affect the work and organization of the Bureau of Agricultural Economics. Dr. H. R. Tolley leaves the post of Administrator of the Agricultural Adjustment Administration to become Chief of the reconstituted Bureau of Agricultural Economics and A. G. Black, former Chief of the Bureau of Agricultural Economics, becomes Director of Marketing and Regulatory Work. The Bureau of Agricultural Economics will have Department-wide responsibility in the formation of programs and plans to guide the entire group of agricultural adjustment, conservation, and marketing services to farmers and the general public. The Program Planning Division and the general planning for marketing programs heretofore in the Agricultural Adjustment Administration, the general land-use planning functions under the Flood Control Acts, Water Facilities Act, forestry programs including farm forestry, wildlife conservation program, tenancy and rehabilitation programs, and erosion control programs have all been transferred to the Bureau of Agricultural Economics. However, some duties have been transferred from the Bureau of Agricultural Economics to other Bureaus. All marketing service, and regulatory work in connection with cotton; dairy and poultry products; fruits and vegeables; grain; livestock; meats and wool; hay, feed, and seed; warehousing; tobacco; market news service; and the Division of Crop and Livestock Estimates will be transferred to one of the four agencies under the Director of Marketing and Regulatory Work.

A project of estimating income parity for agriculture was begun in the spring of 1936 following the presentation of the problem in the Soil Conservation and Domestic Allotment Act of Congress. In response to this legislation, historical prices were collected for the base period 1910 to 1914, surveys were made of farmers' expenditures to supplement existing data, and data gathered on farmers income from non-farm sources. Weights were also calculated

from a consumer survey. Parity was redefined in the Agricultural Adjustment Act of 1938 and this reduced the project requirements to a comparison of incomes without measuring purchasing power, and also restricts comparison to farm income from farm operations exclusive of income to farmers from non-farm sources. The project is a cooperative enterprise with the A. A. A. the Bureau of Home Economics, and the Bureau of Agricultural Economics participating. The estimates of income from agriculture and of agricultural wealth are being prepared under the direction of a committee composed of members of these three organizations with Dr. O. C. Stine, Bureau of Agricultural Economics, as Chairman and Mr. C. M. Purves, Bureau of Agricultural Economics, as Secretary. The Central Statistical Board has also participated in planning and developing this project, being represented by Dr. Morris A. Copeland and Mr. Edwin M. Martin as members of the Board staff.

The results of the study will first be published in a series of preliminary reports or sections under the following four parts: Part I—Farm Income; Part II—Expenses of Agricultural Production; Part III—Prices Paid by Farmers for Commodities and Services; and Part IV—Income to Farmers from Non-Farm Sources.

As soon as possible after these preliminary estimates are completed, they will be summarized in one publication together with a comparison of the net income to farmers with the available data of income to non-farmers.

In connection with farm income estimates, a recent memorandum from the office of the Chief of the Bureau of Agricultural Economics stated that the Division of Statistical and Historical Research will have charge of the "preparation and publication of monthly and annual estimates and forecasts of farm income and wealth, for coordinating these estimates with national income estimates, and for analyzing and explaining the significance of and the reasons for changes in farm income and wealth."

Interstate Commerce Commission

The Interstate Commerce Commission has made a beginning in the collection of statistics of motor carriers by the adoption on August 1, 1938, of forms for quarterly reports of revenues, expenses, and statistics of motor carriers of property and motor carriers of passengers subject to its jurisdiction. The first report is for the quarter ended September 30, 1938. A brief monthly form was also prescribed for motor carriers of passengers.

Bureau of Foreign and Domestic Commerce

A series of charts showing the relative position of goods passing into the hands of the consumer through independent drug and jewelry stores and through lumber and building material dealers has recently been prepared by the Marketing Research Division. The charts portray this movement during each month of 1936 and 1937 and are based upon sales information collected monthly from a sample group of stores in particular states reporting in the

Bureau's Current Trade Statistical Program. Data are shown for twelve mid-western and southwestern states for lumber and building and for drug outlets. Nine states in the same geographical areas are covered for jewelry stores. A table showing the percentage distribution of wholesale sales for eighteen kinds of business over the same period is also available.

The field work has been completed in the Bureau's compilation and analysis of income data and related information such as age, years of practice, type of practice, and location for dentists, osteopathic physicians, chiropractors, chiropodists, and miscellaneous curative professions (excluding the medical profession and nursing). The results are now being analyzed and it is expected that a report will be ready by the end of the present calendar year. This project is conducted under funds made available by the Works Progress Administration for research projects.

An estimate of the dollar sales of men's clothing in department stores for the nine-year period, 1929–1937, has recently been made. These estimates are based upon information collected in connection with the Bureau's Current Trade Reporting Program. A progress report upon this program recently appeared in the *Survey of Current Business*, reprints of which are available upon request.

Bureau of Labor Statistics, U. S. Department of Labor

The Retail Price Division has adopted new specifications for use in food pricing. Preparations are being made for the annual conference of retail price field representatives, to be held in Washington from January 23 to February 8. The program will include a review of the year's work in pricing clothing, on the basis of specifications discussed at last year's conference. There will be study of the new specifications developed for drugs, toiletries and soap, and for shoes.

There are available in mimeographed form surveys of wages, hours, and working conditions in three industries for which it will not be possible to publish printed bulletins. They cover cotton goods, soap, and radio receivers. The November issue of the *Monthly Labor Review* carried summary reports on the furniture study and the comparison of annual earnings of navy yards and private ship yards. Later issues of the *Review* will carry articles on the fertilizer industry, paid vacations in industry, and the annual survey of entrance rates of common labor as of July 1. Studies of wages and hours have been undertaken for boots and shoes, foundries and machine shops, and knit goods and hosiery, and work is nearing completion on the surveys for iron and steel, electrical manufacturing and apparatus, meat packing, woolen and worsted, and dyeing and finishing.

The Division of Construction and Public Employment will conduct a W. P. A. project whose objectives are (1) to secure from state, county, and city records statistics relating to number of hours, number of employees, and amount of pay rolls, by pay-roll periods; and (2) to obtain the same type of data from contractors performing work for these political subdivisions

and whose employees are not hired directly by these divisions. A technical committee composed of representatives of several government agencies will supervise the plans for the project. Every state, all cities over 100,000 population, and a selected sample of smaller cities and of rural counties will be covered; public employees for each county in which a sample city is located will also be included. It is planned that the Bureau will collect statistics of public employment as a regular feature of its work after the conclusion of the project. A study of labor requirements in the machinery and machine-tool industries has been undertaken.

Indexes of employment and pay rolls adjusted to the 1935 Census of Manufacturers have been released in mimeographed form under date of September 1938. The indexes have been revised for the period 1919 to 1938, in order to take into account several revisions in industrial classification as adopted by the Census Bureau. These changes are described in the release containing the revised indexes.

United States Employment Service

During the course of its operations in recent years the United States Employment Service has made several cross-section inventories of all registrants actively seeking work through affiliated employment offices. During recent periods these complete national inventories have been supplemented by sample studies. The widespread inauguration of unemployment compensation benefit payments in January 1938, however, presented a problem in sampling due to the wide divergence of conditions in the states which were paying unemployment compensation benefits and those which were not.

In order to meet this situation a new sampling method has been followed, two sample groups of states being selected to estimate the distribution of trends of the registered job-seekers in the Employment Service. One sample was used to demonstrate what the behavior of the active file would have been if all states had begun payment of unemployment compensation benefits in January 1938. The other was selected to fulfill the opposite circumstance; viz., if no states had begun such payment. The "benefit" sample comprised the following states (all of which began payments in January 1938): Maryland, Minnesota, Rhode Island, Arizona, Utah, and Louisiana. This sample had a validity (r) of .9622. The "non-benefit" sample was made up of five states, none of which had begun payments. They were: Nevada, Delaware, Washington, Missouri, and Colorado. This sample had a validity (r) of .9147.

In addition, two other samples have been selected. The first comprised twelve states, to be used after all states have begun the payment of unemployment compensation as a substitute for complete active file inventories. The sample with a validity (r) of .9941 was composed of the following states: Delaware, Utah, Nevada, Maryland, Wisconsin, Arizona, Colorado, Rhode Island, Louisiana, Washington, Connecticut, and Nebraska. The other

sample was designed as an interim measure to provide for surveys on the basis of the "benefit-paying" hypothesis until the main sample can be used. This sample of eight states has a validity (r) of .9934. The states are: Wisconsin, Maryland, Connecticut, Louisiana, Minnesota, Arizona, New Hampshire, District of Columbia, and Utah.

The technique used to select these samples was primarily a minimizing function which selected the state whose occupational statistics were most similar to those of the United States. Repeated applications of the function made it possible to add successively those states which, when added to previously selected states, would most nearly approximate the United States distribution. A more detailed exposition of this technique is being prepared for publication.

Bureau of Research and Statistics, Social Security Board

The Division of Public Assistance Research recently expanded the scope of its statistical reporting program to include financial statistics relating to (1) administrative expenses, (2) relative amounts of Federal, State, and local funds used to finance public assistance and relief expenditures, and (3) revenue sources of State and local funds. The reporting system which provides for semiannual reports by State public welfare agencies is being introduced on an experimental basis during the six-months period ending December 31, 1938. More than one-half of the State agencies have already indicated their interest in and their willingness to cooperate in this experiment. One of the principal problems associated with the preparation of these data is that of arriving at a satisfactory method of apportioning administrative expense among the different programs administered by a State public-welfare agency. The Division is preparing material for the use of State agencies in developing adequate and sound procedures for carrying on time studies which can be used to make such an apportionment. From experience gained during the experimental period revisions in the original plan will be made and more adequate underlying procedures and techniques developed.

Monthly reports submitted by public and private relief agencies in the 116 urban areas included in the trend of urban relief from 1929 to date have been revised and corrected through December 1937. Revised figures for the trend of relief in each individual area, as well as for the United States total, are now available. The total amount of obligations incurred and the amount per inhabitant for the calendar year 1937 were published in the *Social Security Bulletin* for September 1938. An article by Anne E. Geddes on *Relief Trends in Cambridge, Massachusetts, 1929–1937*, based on the data collected for this series, appeared in the *Social Security Bulletin* for August 1938. The data collected in this series also furnished the basis of an article on a *Seasonal Index of Urban Relief* by Helen R. Jeter and Herman W. Gruber which appeared in the July issue of the *Social Security Bulletin*.

Bureau Report No. 1, *Tabular Summary of Statistics of Public Assistance under the Social Security Act for the Calendar Year 1937*, and Bureau Report

No. 2, *A Plan for a Case Census of Recipients of Public Assistance*, will shortly be available for distribution. Bureau Report No. 1 presents monthly data on the special types of public assistance by States for the calendar year 1937 and the number of recipients of the special types of public assistance and the amount of obligations incurred for payments to recipients, by counties for December 1937. Bureau Report No. 2, prepared by Margaret C. Klem, is a manual for the use of State and local welfare agencies interested in conducting a case census.

The Division of Public Assistance Research has completed a chart on the organization for the administration of general relief as of December 1937. This will be published in the *Social Security Bulletin* for November 1938.

The analysis of the 1937 and 1938 annual reports to the Social Security Board, from State agencies administering public assistance, about the social characteristics of recipients of the special types of public assistance will appear in a series of articles in the *Social Security Bulletin;* these articles will then be reprinted in a single publication.

With a view to greater simplification of administration of unemployment insurance, a comprehensive study is now being made of the experience gained by the States. A representative sample of workers' wage records was obtained from the Maryland unemployment compensation agency, and an extensive series of runs were made of these data. Similar data from the Minnesota agency are being processed. The tables were designed to test the various benefit formulae and their component parts, eligibility, benefit rate, and potential duration of benefits. Tests were made of the differences between use of full-time weekly wage compared with use of 1/13 of the highest quarter's earnings as an alternative to the full-time weekly wage. Various runs were made to test the effect of varying types of base periods. In addition to these data, samples of claim and benefit-payment records for individuals whose benefit rights were exhausted were secured from Rhode Island. Runs of these cards are in process. It is expected that an outline presenting the various alternative simplification procedures will be presented at the Interstate Conference of Unemployment Compensation Agencies, to be held in Washington, October 20–23.

Coincident with the work on simplification of unemployment compensation administration, the Bureau has been reviewing the Board's statistical-reporting requirements. A conference was held August 17–20 in Washington with the Technical Subcommittee of the Committee on Research and Statistics of the Interstate Conference. Mr. Meredith B. Givens, Director of Research and Statistics of the New York unemployment compensation agency, presided. A number of recommendations were drafted and the Bureau has been preparing a revision of the statistical requirements along the lines suggested. These suggested revisions will soon be forwarded to State statisticians for comment and criticism. The revised benefit statistics reflect greater refinement than was feasible when the statistical-reporting program was initiated.

In connection with a comparison of relative economic resources and wel-

fare needs of the States, the Division of Economic Studies cooperated with the Price Section of the Bureau of Agricultural Economics in developing State differentials in the prices paid for living by farmers. These differentials were recently released by that Bureau. The Division of Economic Studies is also cooperating with the Bureau of Agricultural Economics, the Bureau of Labor Statistics, and the Works Progress Administration in exploring the possibility of developing comparable cost of living data for rural and urban areas.

The Division of Health Studies is engaged in research concerned with the problem of health security. A number of studies are in progress to determine sickness and disability rates in the United States. These studies draw upon the experience under various foreign plans of health insurance and upon data available from voluntary health insurance and sickness surveys in the United States.

Data are being gathered on the cost of medical care for families of different income levels and likewise the cost of medical care under various insurance plans. Studies are in process of the actuarial experience, i.e., demand for medical service under insurance plans.

Bureau of Old-Age Insurance, Social Security Board

In the September issue of this JOURNAL a statement of the statistical program of the Bureau of Old-Age Insurance was published. Some of the studies mentioned in that issue have now been completed and others are in process.

The study of the Adjustment of the 1930 Census Enumeration of Gainful Workers to the Statutory Coverage of the Social Security Act has been mimeographed and distributed to a limited number of officials of the Board.

Tabulation of the first installment of 1937 Employer Returns has been completed and the results were published in the September issue of the *Social Security Bulletin*. Distributions of number of employers, number of wage items, and amount of wages were presented by size of firm, as indicated by the number of employee wage items on employers' returns. This first tabulation was made on a basis of reporting organization and, in the case of multi-establishment employers, no attempt was made to proportion the total amount of employment and wages to the individual establishment. According to the present plans, the second installment will give this latter information in a cross tabulation by city, by size classes within each State, and by State within major industry group. The proposed plans for the tabulation of 1937 data for individual employees include distributions by age, sex, race, and earnings within the State in which each employee was working during the second half of the year. Employees found to have been working at some time during the year in States other than those in which their account numbers were assigned are considered as migrants, and a cross tabulation between States of emigration and immigration will be made.

A preliminary tabulation of the non-migrants by age, sex, race, and earnings is about half completed.

All employers' applications for identification numbers are now being coded both for industry and for geographical location, as a basis for statistical tabulations. In this connection a special geographical code has been constructed.

The Claims Punch Cards which were mentioned in the September issue of this JOURNAL have been ordered. All plans for copying, coding, and punching claims data have been completed. This project will be under production very shortly, and will be a source of statistical data showing the characteristics of wage earners who have died or attained the age of 65. For example—their sex, color, age, marital status, last occupation, and wages will be available. A limited amount of data pertaining to survivors may also be obtained from these cards, such as their number and relationship to the wage earner and the amount of funeral and last illness expenses paid by the claimant.

Division of Statistics and Economic Research, Works Progress Administration

A review of the statistical needs of the state WPA Administrations is being made. As part of this review, a series of regional meetings of state statisticians is being held in the WPA Regional Offices. These meetings are devoted to a discussion of the types of statistical data found useful in administering the WPA in the states and the procedures used in compiling such data. A new monthly report was inaugurated by the WPA in May. The report shows accessions and separations of persons certified for employment on WPA projects and constitutes the basis for a monthly series of WPA labor turnover rates.

Data on the physical accomplishment of WPA projects through June 30, 1938, are being tabulated and will be available soon.

Division of Social Research, Works Progress Administration

Depressed Areas. A recently approved survey will be devoted to the study of the "hard core" of relief and the problem of the long-time unemployed as exemplified by the population in areas where there has been a prolonged dislocation of the basic industry or industries. The survey will attempt to determine the nature and causes of these dislocations, the effect upon the population, and the practicability of proposals for rehabilitating these areas. Exploratory field investigations have been made in New Bedford, Massachusetts, and in Southern Illinois with a view to perfecting procedures to be used in these and other areas.

Study of Rural Problem and Non-Problem Areas. Independently of the rural farm areas, 173 non-farm areas have been tentatively established. Basic criteria used in this procedure include the proportion of gainful workers in various industries, together with a plane of living index and population fertility ratio. Rural non-farm areas vary in type from isolated rural indus-

trial communities to large cut over areas, mining areas and manufacturing districts.

The two series are being compared in an effort to combine them into homogeneous areas which will include both rural farm and non-farm population.

Concepts Used in Unemployment Surveys. As a result of an examination of some 40 enumerative studies of unemployment made since 1930 a memorandum has been prepared discussing the concepts used in measuring unemployment. The memorandum is divided into two parts. The first part attempts to evaluate the concepts most usually found in terms of their effectiveness both in field enumeration and in providing information that is comparable from survey to the next. In the second part of the memorandum a plan for making enumerative studies is proposed which attempts to avoid many of the difficulties that are inherent in the concepts that have heretofore been employed. A limited number of mimeographed copies of this memorandum have been prepared and are available to those interested in the problems of unemployment surveys.

A Study of Rural Youth Adjustment. A detailed study is in progress to show the adjustments rural youth have made since 1929. This survey will provide separate analyses of youth who have migrated to the cities and of youth who have remained in agricultural and rural industrial areas.

Rural Population Mobility in the United States. To provide a better under standing of the extent and nature of rural population mobility in the United States a comprehensive report of rural population movements in relation to significant social and economic factors is being prepared. The report will include chapters on the major types of rural population mobility; provide, in historical sequence, descriptions of major rural population movements before 1930 and farm movements since 1930; and present an intensive analysis of rural migration during the decade 1920–1930.

Housing Surveys. Instructions for conducting low-income housing area surveys are being prepared by the Division in cooperation with the U. S. Housing Authority and the Federal Housing Administration. The survey will provide data on family composition, the annual incomes of each member of the household, and the location of employment relative to residence of each gainfully occupied member. The information is designed for use by local housing authorities to determine the number of families living in substandard dwelling units who are eligible for rehousing under the terms of the act creating the U. S. Housing Authority. Substandard dwelling units will be located in the course of real property surveys which are to be conducted in conjunction with this survey. Real property surveys are now operating as WPA projects in more than 25 cities, and low-income housing area surveys are to be conducted in a majority of these.

Resurgence of interest in housing surveys has led to the preparation of a summary of the real property surveys conducted in the years 1934–1936. This will be published by the Division of Social Research under the title of

Urban Housing: A Summary of Real Property Inventories Conducted as Work Projects, 1934–1936.

Agricultural Experiment Station of the A & M College of Texas

With the cooperation of the Works Progress and Farm Security Administrations, studies of recent changes in farm tenancy and farm labor are under way. The relation of recent farm mechanization and crop control to the problems being studied is being given special attention. This study will cover approximately 450 large scale farms and plantations located in 26 different counties where cotton is the major farm enterprise. In addition to a record of mechanization and farm organization changes on these large farms, approximately 500 records covering the status, mobility, employment, housing, incomes and related data on farm laborers and their families will be obtained. Mr. W. C. Holley, Assistant State Supervisor of Rural Research, WPA, is in active charge of the field work on this project.

Another cooperative project, with the Agricultural Adjustment Administration, will begin October 15. This project provides for further study of cropping systems and farm rental arrangements in relation to the agricultural adjustment programs.

A paper on "Texas Farm Tenure Activities" has been published in the *Journal of Land Public Utility Economics* for August, 1938. Reprints will be mailed to those who write to the Experiment Station, College Station, Texas, requesting them.

Research Projects at Dun & Bradstreet, Inc.

1939 Business Trend Survey. Plans are being made for a repetition of the Business Trend Survey made last year. The questionnaires will go out about January first to over 2,000,000 business concerns listed in the *Dun & Bradstreet Reference Book*, asking trend of sales and inventories for 1938 as compared with 1937.

In addition, it is expected that some questions will be added in an effort to measure the tax burden of industry, particularly the differences in the impact of taxes on large and small enterprises and the differences between various trades and industries. The results are expected to be available sometime in March, 1939.

Surveys of Wholesalers' Operating Costs. Three of the surveys discussed in the June issue of this JOURNAL have been carried forward and are expected to be ready for distribution in November. These are the reports covering the following trades: Paint and Varnish, Dry Goods, and Automotive and Equipment.

National Bureau of Economic Research, Inc.

As a result of a decision by the Board of Directors of the National Bureau to extend the representation of universities in its membership, two universities have made nominations: Minnesota and North Carolina. On October 20, the Executive Committee of the National Bureau elected Guy

Stanton Ford, President of the University of Minnesota, and Frank P. Graham, President of the University of North Carolina, to serve as Directors by University Appointment.

A Committee on Cooperative Research has been appointed by the Executive Committee, after nomination by the respective universities, to supervise the cooperative program of the National Bureau and especially its relations with university research. The members are: California, R. D. Calkins (alternate, M. R. Benedict); Chicago, Jacob Viner (alternate, S. E. Leland); Columbia, J. C. Bonbright (alternate, Carter Goodrich); Harvard, John D. Black (alternate, Alvin H. Hansen); Michigan, I. L. Sharfman (alternate, W. A. Paton); Minnesota, R. A. Stevenson (alternate, R. G. Blakey); North Carolina, Eric W. Zimmerman (alternate, Clarence Heer); Pennsylvania, Anne Bezanson (alternate, William J. Carson); Stanford, Joseph S. Davis (alternate, Norman J. Silberling); Wisconsin, Martin G. Glaeser (alternate, Harold M. Groves); National Bureau of Economic Research, Wesley C. Mitchell (alternate, Simon Kuznets). Additional members may from time to time be designated by the National Bureau for special purposes.

The first of the industry committee reports, *Prices in the Bituminous Coal Industry*, has been issued. Reports are expected from the other five committees on iron and steel, oil, automobiles, textiles, and distribution costs and pricing policies at retail. A standing committee on Cost-Price Relationships is being formed under the chairmanship of E. S. Mason of Harvard University. An outgrowth of the coal report is the creation of a standing committee to deal with price problems of the bituminous coal industry. W. E. Fisher of the University of Pennsylvania is chairman.

National Industrial Conference Board

Continuing its *Studies in Personnel Policy*, the National Industrial Conference Board recently issued the eighth and ninth in the series. "Plans for Rating Employees" deals with information received from 94 companies as to periodic appraisals of employees. Tables show the distribution of rating systems, the percentage of employees affected, and various company practices in making ratings. In "Health Insurance in Industry—Mutual Benefit Associations," the Board has tabulated returns from 277 companies on prevailing policies in the administration of benefit societies. Statistical information is given about the amount of dues, the size of benefits, the types of benefit payments, membership requirements, and other features of benefit associations in various companies. A further study in this field is now in progress and will cover group health insurance and company non-contributory disability benefit plans for wage earners. A survey of company public relations activities is also being conducted, and the results will soon be published.

The Board's study of "Cost of Government in the United States, 1935–1937," is another in a series of exhaustive analyses of public finance. In this

163-page book are discussed governmental expenditures, tax collections, the federal deficit, public debt, and social security finances. An appendix contains valuable data as to the sources and methods used in compiling the statistical material.

In addition to its regular monthly studies of earnings, hours, and employment in manufacturing industries, the Board assembled a summary of such material in a recent publication entitled, "Wages, Hours and Employment in the United States, July, 1936–December, 1937." Extensive statistical discussions are contained in another publication, "Revised Estimates of Employment and Unemployment," in which are included some notes as to the methods of estimating employment.

Data from 74 cities are contained in the article on "Local Variations in the Cost of Living," a continuation of the Conference Board's actual cost figures for maintaining a given standard of living in a large number of American communities.

It is expected that a book on the economic position of Russia will soon be published, containing the results of the Board's investigations of the Soviet economy. Other studies in progress include research on the availability of bank credit; an article on the national finances of the United Kingdom; a survey of depression and recovery in the United Kingdom; a report on income distribution in the United States and foreign countries; a summary of the Walsh-Healy Act decisions; and a brief study of the salaries of corporation executives.

The Twentieth Century Fund

Early in November The Twentieth Century Fund will publish a book entitled "Debts and Recovery," which reports the results of a study of changes in the internal debt structure of the United States during the depression and recovery years. Albert G. Hart, of the University of Chicago, was director of the study.

The study of the economic effects of short selling on the New York Stock Exchange, under the direction of Dr. Fred R. Macaulay, is continuing, and a large amount of material never before available regarding the short position and the volume and timing of short selling operations has been assembled and is being analyzed. The report will not appear until after the end of the year.

The study of "Distribution and Its Costs" is in final manuscript form and, upon approval by the Fund's Committee on Distribution, it will be ready to send to the printer. This study is based upon an extensive analysis of Census of Distribution data, and will probably be published some time before the end of the year.

CHAPTER ACTIVITIES

The Albany Chapter

The Albany Chapter had an unusual meeting on October 25: a tour through the Division of Placement and Unemployment Insurance of the New York State Department of Labor while the staff of the Division was at work. The tour was conducted by Mr. Milton Bass and Mr. C. M. Armstrong, with detailed explanations and demonstrations of the operations required in handling the wage records of the more than 3.5 million employees that are on file and the claims for unemployment benefits that have ranged from about 120,000 to nearly 400,000 per week since January 29. This work utilizes punched card tabulation very extensively for many of the steps of recording and computing. About 50 persons were present at these demonstrations.

Following this, a dinner meeting was attended by 53 persons, making a total attendance altogether of about 75 people. Mr. Bass and Mr. Armstrong gave a further brief discussion of the application of mechanical tabulation to the Unemployment Insurance activities, followed by questions and answers.

Mr. Armstrong also discussed briefly the presentation made on behalf of statisticians in state service at the hearing of appeals by the Temporary Salary Standardization Board of New York State with reference to salary allocations for the various grades of statisticians. Particular attention was given at this hearing to the question as to whether statisticians should properly be allocated as professional workers. The work of the Chapter's Committee on Professional Standards for Statisticians in New York State Service was reviewed by Dr. R. L. Gillett, and the preliminary report of the Committee was presented. This report stresses the need for thoroughly trained workers in statistics in the public service and outlines some minimum qualifications that are believed essential for professional workers selected through Civil Service examinations, including broad fundamental training.

The Austin Chapter

The Austin Chapter held its first regular meeting of the current academic year on October 21. Dr. C. T. Gray, Professor of Educational Psychology at the University of Texas, presented an address on "Statistical Problems in Education."

The Chicago Chapter

For the first meeting of the 1938–39 season, the Chicago Chapter on October 18 joined the local organization of the American Marketing Association to hear Mr. W. S. Townsend, President of Townsend and Townsend, Inc., New York, Advertising Counsellors. Mr. Townsend spoke on the scientific measurement of advertising.

In discussing the research which led to the selection of the 27 points used in the Townsend system to evaluate the effectiveness of an advertisement before it is published, Mr. Townsend compared these 27 factors to a football team in which each has a definite function to perform, in a certain sequence. If some players are left sitting on the bench instead of being used in the line-up, the effectiveness of the team is impaired to that extent.

Mr. Townsend expressed the conviction that advertising is a much more potent factor than is generally recognized. By using it more effectively to create more sales, thus increasing production, it would help to solve the problem of unemployment.

The Cincinnati Chapter

Mr. Procter Thomson, of the Chemical Division of Procter and Gamble Company, addressed the Chapter on "Industrial Applications of Statistical Method," at the first fall meeting on November 3. Mr. Thomson told how statistical methods were being used to standardize important chemical procedures in the manufacturing department of his company.

The Cleveland Chapter

The first meeting for the season of the Business Statistics Section of the Cleveland Chapter was held on September 26. Sixteen members and guests were present. Mr. K. H. MacKenzie of the Cleveland Federal Reserve Bank was chosen as Chairman. Mr. W. T. Diebold of The Ohio Bell Telephone Company was reelected Secretary. The meeting was devoted to a forecast of the Federal Reserve Board's index of industrial production for the next twelve months. Ten members presented estimates. Four of the ten predicted an increase during the year of 20 per cent, one forecast a 30 per cent increase, and the remaining five predicted little change.

The Connecticut Chapter

A meeting of the Connecticut Chapter was held on October 4 at which Mr. Frederick F. Stephan, Secretary of the American Statistical Association, spoke on "Changing Demands for Statistics and Statisticians."

The Lehigh Valley Statistical Society

On October 21, Mr. G. A. Roush, nationally known student of mineral statistics, spoke to the Chapter on his experiences of editing *The Mineral Industry*, an annual volume presenting and interpreting mineral statistics. Professor Allison Butts, of Lehigh University, who has written one chapter in the volume in recent years, opened the discussion.

The Philadelphia Chapter

"Capital Financing and Business Recovery" was the topic for the meeting of the Chapter on May 20. Dr. George Terborgh spoke on "The Need for

New Capital," and Dr. Claude L. Benner on "Some Factors Controlling the Demand for Capital."

The Philadelphia Chapter held its first meeting of the 1938–39 season on October 28, the subject for which was "Developing a Factual Basis for Collective Bargaining: A Review of the Experience of the Hosiery Industry." Dr. George W. Taylor, Impartial Chairman, Hosiery Industry, discussed "The Industry-Wide Collective Agreement," bringing out the way in which the industry wage policy is formulated and administered in relation to a research program. Mr. Alfred Hoffman, Research Director of the American Federation of Hosiery Workers, spoke on "The Union Research Department," explaining the facts which assist a union in achieving high wages and low labor costs. The third speaker was Mr. F. D. MacIver, Vice-President, Phoenix Hosiery Company, who presented "A Personnel Program for a Unionized Plant," with particular reference to the use of records in "bargaining" over such matters as promotions, lay-offs, piece-rates, and time-rates.

The Pittsburgh Chapter

A discussion on "The Effect of the 1937–38 Depression upon Relief Expenditures," led by Mr. Ralph Carr Fletcher, Director of the Bureau of Social Research, Federation of Social Agencies, comprised the program for a meeting of the Chapter on October 27. A number of persons responsible for the administration of relief programs in the community attended the meeting and participated in the discussion.

The San Francisco Chapter

A meeting of the San Francisco Chapter was held on October 20, the general topic for which was "The Business Outlook." Professor Howard Ellis, of the University of California, spoke on "The International Credit Situation." Professor Robert A. Gordon, of the University of California, discussed "Prospects for Expansion in the Capital Goods Industries." Dr. Joseph S. Davis, Director of the Food Research Institute, Stanford University, presented "The Agricultural Outlook." Professor T. J. Kreps, of Stanford University, summarized the speeches, after which there was a general discussion.

The Washington Statistical Society

"The Statistical Basis for a National Health Program" was the subject of the meeting of the Washington Statistical Society held on October 13. Dr. Joseph W. Mountin, of the U. S. Public Health Service, presided. The principal speakers of the evening were: Mr. I. S. Falk, of the Social Security Board, Mr. George St. J. Perrott, of the U. S. Public Health Service, and Dr. Martha Eliot, of the U. S. Children's Bureau.

HARRY JEROME

Harry Jerome, widely known as a worker in statistics and economics, died at Madison, Wisconsin, on September 11, 1938. He was born in Bloomington, Illinois, on March 7, 1886, and graduated from the University of Omaha in 1912. From 1912 to 1914, he taught history and economics at that Institution. Since 1914 he was connected with the University of Wisconsin, where he received a Master of Arts degree in 1915 and a Ph.D. degree in 1918. Since 1920 he was professor of economics and he served as chairman of the Economics Department from 1931 to 1936.

In addition to his work at the University of Wisconsin he had many other interests and working connections. In 1919 and 1920 Dr. Jerome worked as income tax assessor for the Wisconsin Tax Commission, and later taught a course in taxation at the University. From 1923 to 1925 he was on the staff of the National Bureau of Economic Research. For a number of years and until his death he was a director of that Bureau. Though he returned to his teaching at Wisconsin in 1925, he always maintained his connection with the National Bureau of Economic Research, and his last two books were written in conjunction with his work in that organization. These are "Migration and Business Cycles" (1926) and "Mechanization in Industry" (1934).

His textbook, "Statistical Method," appeared in 1924 and was widely used in the teaching of elementary statistics. At the time of his death, Dr. Jerome was engaged in the revision of this early text.

Since September, 1936, he worked almost continuously on a survey of productivity and changing industrial techniques, which was conducted as a national research project of the WPA in cooperation with the National Bureau of Economic Research. This was a continuation and further development of his researches with the same organization in the years 1923 to 1925. For most of a year ending in June of 1937 he directed this work from Philadelphia, being on leave of absence from the University.

Professor Jerome was for many years actively interested in the affairs of the American Statistical Association and the American Economic Association. Only a few months ago he organized the Madison, Wisconsin, Chapter of the American Statistical Association, and he was serving as this Chapter's first president at the time of his death. From the beginning of his work in Wisconsin, he was always interested in state affairs, and he was one of the original members of the Wisconsin Committee on Statistics and an active member of the Advisory Board of the Wisconsin income tax study, which is now in progress. In 1933, he initiated the cost of living survey in Madison which is still being continued.

In addition to being a patient and highly disciplined research worker, Dr. Jerome was a devoted teacher and he always had the confidence of his students. In fact, his work with the student body, especially the graduate group, seems to have brought most strongly into play those rare qualities

which his friends liked so much. Those who really came to know him, loved him, and few men have had the good fortune of having as devoted a following in their students as did Harry Jerome. And it is in his students fully as much as in his writing that his work and his spirit will live on.

In his passing, the profession, his friends, and co-workers have all lost very much. His kindly personality, his modesty, and his simplicity in work and purpose inspired those associated with him. His memory is dear to many who had come to value his counsel and judgment in research and teaching problems.

As a memorial to Professor Jerome, his students, his friends, and co-workers are arranging for contributions to a scholarship fund which is to be established in his name and in recognition of his services at the University of Wisconsin. This fund is in the care of Dr. Edwin E. Witte, chairman of the Wisconsin Department of Economics, and he handles the correspondence regarding this memorial.

WALTER H. EBLING

NEW MEMBERS

Beum, Corlin O., Jr., Student, Ohio State University, Columbus, Ohio

Chase, Arnold E., Assistant Statistician, U. S. Bureau of Labor Statistics, Washington, D. C.

Cummings, Dr. Helen F., Research Assistant, Boston Public Schools, Department of Educational Investigation and Measurement, Boston, Massachusetts

Cushman, Edward L., Research Economist, Michigan Unemployment Compensation Commission, Detroit, Michigan

DeWolf, Tensard, Director, Bureau of Research and Information, Pennsylvania Department of Labor and Industry, Harrisburg, Pennsylvania

Eshleman, Benjamin Franklin, State Statistician, Works Progress Administration of Louisiana, New Orleans, Louisiana

Evans, Wilmoth D., Associate Economist, U. S. Bureau of Labor Statistics, Washington, D.C.

Filho, Dr. Lincoln de Freitas, Assistant, Div. Biostatistic-National Dept.Health, 128, R. do Resende, Rio de Janeiro, Brazil, South America

Frankenstein, Katharine D., Research Librarian, Batten, Barton, Durstine and Osborn, Incorporated, New York City

Fraser, Alfred A., 3rd., Investment Department, United States Trust Company of New York, New York City

Gore, James L., Senior Statistician, Tennessee Unemployment Compensation Division, Nashville, Tennessee

Greenman, William B., Jr., Manager, Research Department, Van Cleef and Jordan, New York City

Hamilton, Eugene L., Director for Area 8, Division of Research, Statistics, and Records, Survey of Works Program Employment Histories, Dallas, Texas

Hayes, Josef J., Statistician, Department of Public Welfare, Garden City, Nassau County, New York

Hayes, Dr. Samuel P., Jr., Sarah Lawrence College, Bronxville, New York
Herzog, Arthur L., Manager of Statistical Department, Chicago City Bank and Trust Company, Chicago, Illinois
Holmes, Irvin, Agricultural Statistician, U. S. Department of Agriculture, Washington, D. C.
Hooper, Wallace D., Regional Statistician, Works Progress Administration, Chicago, Illinois
Lerner, Abba P., Assistant Lecturer, London School of Economics, c/o Rockefeller Foundation, New York City
Levenson, Hollis M., Psychologist, Boston State Hospital, Dorchester Center, Boston, Massachusetts
Lilliedale, Juanita, Statistical Clerk, Bureau of Home Economics, Department of Agriculture, Washington, D. C.
Murray, Merrill G., Assistant Director in Charge of Analysis Division, Bureau of Old-Age Insurance, Social Security Board, Washington, D. C.
Padgett, Mildred, Assistant Economist, Consumers' Counsel Division, Department of Agriculture, Washington, D. C.
Phillips, Donald, Fellow, College of the City of New York, New York City
Roeder, Edward M., State Statistician, Works Progress Administration, Nashville, Tennessee
Sells, Dr. Saul B., Senior Research Analyst, Works Progress Administration for the City of New York, New York City
Stewart, John R., Statistician, Detroit Board of Commerce, Detroit, Michigan
Wallis, Rolland S., Director of Research and Statistics, Division of Unemployment Compensation and Employment Service, Department of Labor and Industry, Harrisburg, Pennsylvania
Woolsey, Theodore D., Junior Statistician, Vital Statistics Division, State Department of Health, Albany, New York

BOOK REVIEWS

RALPH J. WATKINS
Review Editor

The Theory and Measurement of Demand, by Henry Schultz. Chicago: The University of Chicago Press. Social Science Studies Directed by the Social Science Research Committee of the University of Chicago, Number XXXVI. 1938. xxxi, 817 pp. $7.50.

Ten years' research by a distinguished author and a staff of able assistants presented in this very substantial volume cannot but command respect. A synthesis of theory with empirical studies, of the kind so necessary for the development of economics as a science, is accomplished beautifully. The theoretical chapters present basic considerations found in general treatises on economics but present them more accurately and explicitly with the help of mathematical methods. The factual chapters are concerned with the demand functions, as ascertained from time series, of a list of agricultural commodities.

A chapter each is devoted to sugar, corn, cotton, hay, wheat, potatoes, oats, barley, rye, and buckwheat. Each of these chapters begins with a general survey of the production and consumption of the commodity in question and of the relevant statistical data. Demand functions calculated by least squares from time series, with time as an additional variate to take account of trends and guard against spurious correlations, are then presented in each case. These are calculated separately with price and with quantity as dependent variates; and in each instance both constant-elasticity and linear demand curves are fitted. Deflated prices, and quantities divided by population (or animal population units in the case of crops fed chiefly to horses, mules, cattle, and hogs) are used in each case, and in addition some regression equations are fitted without these preliminary adjustments of the variates and in various other ways. This would make a large job of least-square calculation, but the actual work of the kind is several times as great as this suggests; for the time series are broken into two, three, or four parts, with separate computations of all four regression functions for all the different periods, and a comparison of the independent results thus obtained. Additional calculations take account of such factors as national income and general business conditions. For all this, not only are standard errors computed, but exact tests of significance are applied in the places in which they are most important. This step, unfortunately lacking in a good deal of statistical work, is essential in distinguishing underlying forces revealed by the data from chance, and is especially important in economic time series in view of the small number of good observations available in each case and the number of degrees of freedom that have to be used up to take account of trend and other sources of deviation from independence of consecutive ob-

servations. Summaries and conclusions, some of which are novel and have great interest in connection with questions of agricultural and public policy, are given at the end of each of these chapters with respect to the particular commodity, and at the end of the group of chapters for the list of commodities as a whole. It is noteworthy that in every case, without exception, a demand curve of the downward-sloping kind suggested by theory emerges from the calculations. The elasticity of demand for sugar is particularly consistent, taking values in the neighborhood of .3 and .4 in each of the three periods 1875–95, 1896–1914, and 1915–20, as computed by each of the various methods. The differences appear to be of an order reasonably attributable to chance. For the list of commodities in general the elasticities are less than unity, indicating that in each case a large crop is worth less to the farmers than a small one, so that a monopolistic measure of restriction of production could for each commodity be expected to be successful in increasing the income of the producers of that commodity. Whether this could be done for all the farm commodities at once is quite another question, which the author does not discuss. In spite of the justification for crop-control *for any one commodity* indicated by Professor Schultz' statistical findings (from the standpoint, of course, of the producers of that commodity alone), as well as by investigations of L. H. Bean, Mordecai Ezekiel, and others, there is no proof that crop-restriction in general benefits farmers in general, to say nothing of the rest of the population. It is an extremely important point, which does not seem to have been grasped by the authors of the Agricultural Adjustment Act and other crop-restriction measures, that the elasticity of demand for every single commodity may have a numerical value less than unity, so that classical theory would point to a reduction of production as a way to increase income, without the joint cost and demand functions for a long list of commodities having the character necessary for the successful application of crop-reduction in increasing the total of agricultural income. The fallacy lies in the classical habit of considering only one commodity at a time, without regard to their interrelations.

The study of interrelations of demand for different commodities, necessarily complex but yielding beautiful results by the application of higher mathematics, is the subject of careful study in Chapters 18 and 19. This is indeed a field in which mathematics has made distinctive contributions to economic theory in demonstrating the falsity of many classically accepted dogmas, as well as establishing some of the old propositions and many new ones on a substantial basis. Not only quantitative but qualitative features of the economic system have in this way been found to have quite a different nature from that attributed to them by literary economists. An important part of modern mathematical economics is set forth in these chapters and in the introductory ones. A beginner may indeed very well be referred to Chapters 1, 18, and 19 for a conspectus of elementary mathematical economics and a study of some fundamental concepts. Among other things Chapter 1 includes an account of the important paper by the Russian economist

and statistician, Eugen Slutsky, published in Italian in the *Giornali degli Economisti* in 1915, and unfortunately overlooked until very recently.

The other chapters, in addition to theoretical discussions of completing and competing goods, present the results of statistical determinations of simultaneous demand functions for several groups of commodities. These groups are (1) beef and pork, (2) sugar, tea, and coffee, (3) barley, corn, hay, and oats, (4) beef, pork, and mutton. Studies of this type are absolutely essential to forecasts of the probable effects of bounties, excise taxes, crop-control programs, tariffs, and other such measures. In the absence of such quantitative determinations of the appropriate coefficients, and of their proper use in the mathematical investigation of the prospective effects of the proposed measures, it is perfectly possible that governmental measures may have effects directly opposite to those sought by their authors. (For proof of this statement, see my article in the *Journal of Political Economy* for October, 1932.) To get any clear idea even regarding such a simple question as whether the farmers producing a single commodity (for example, corn) are helped or injured by a bounty of so much per unit on that commodity requires studies like those of Professor Schultz for a group of related commodities, not only for demand but for supply. The relations among the commodities vitiate completely the classical reasoning about the division of excise taxes and bounties between producers and consumers.

There is a good discussion of various definitions of competing vs. completing goods. The best of these, at least with respect to a single consumer, seems to have been reached independently by Professor Schultz and by J. R. Hicks very recently. It is given on p. 622 and is based on one of Slutsky's results. The question of the *symmetry* of the multiple demand functions is discussed both theoretically and statistically.

The author draws his inspiration from many sources but chiefly from the pioneering work of Henry L. Moore, to whom the book is dedicated. Moore's methods are used, with modifications indicated by the progress of statistical theory in recent years and by experience. The methods of deriving demand curves used by Leontief, Pigou, Frisch, Marschak, and Roy are discussed critically. Though confining his own statistical studies to time series, the author does not reject the possibility that the derivation of demand functions from family budget data may in the future give results of importance.

Those who doubt the value of conclusions drawn from time series may well point out the difficulties and statistical fallacies with which such studies are beset. The sources of these fallacies seem to have been eliminated from Professor Schultz' work as nearly as it is possible to do this without a great and impractical extension of an already immense labor. It remains true, of course, that the results of time-series analysis can never have the type of validity inherent in randomized allocation of treatments such as is described in R. A. Fisher's recent book, *The Design of Experiments*. But economic statistics would be in a sad plight indeed if this consideration were enough to cancel the force of inferences drawn from time series. When significant results

are reached, such as many of those reported in this book, we accept them, tentatively of course, so long as we cannot find any basis for explaining them away. The author has been very careful in guarding against spurious correlations due to trend and similar fallacies.

An appendix giving the original series used will be a valuable help when extending or checking the work is undertaken. Another appendix is a 52-page treatise on the elements of curve-fitting and correlation and will be useful to many students for its own sake. The whole book is exceptionally well documented. It presents both sides of various controversial questions without, however, failing to reach definite conclusions.

HAROLD HOTELLING
Columbia University

Les Variations du mouvement saisonnier dans l'Industrie de la Construction, Etude méthodologique et analyse des faits, by Horst Mendershausen. Geneve: Georg & Cie. S. A. Libraires/Editeurs. Librairie de l'Université. 1937. 209 pp. 6 Swiss francs.

This highly illuminating volume is more comprehensive than its title implies. Its outstanding characteristic, in the opinion of this reviewer, is its careful adaptation of methods of correlation analysis to a study of the differences from year to year in the month-to-month variations in time series. Construction employment data form the basis of the detailed analysis illustrating these methods, but the methods themselves are equally applicable to the general problem of measurement of variations in seasonality.

Few problems of elementary statistical methodology have been the occasion of more discussion than the proper method of calculating indexes of seasonal variation. The methods most widely used either assume perfect seasonal regularity for all practical purposes or, by simple methods such as the calculation of a gradually changing series of indexes, attempt to allow for the differences from year to year. Mendershausen advocates the measurement of changes in seasonal variation in terms of logically related causal factors.

The volume contains two chapters, several statistical appendices, and a detailed bibliography. Chapter I includes a brief but comprehensive summary of the methods of calculation of indexes of seasonal variation most widely used at the present time; a more intensive review of the methods which recognize changing seasonal variation; a summary statement of the different types of seasonal fluctuations; and an outline of the procedures which are proposed for the analysis and measurement of these fluctuations.

In Chapter II Mendershausen gives a detailed account of the analysis which he has made of the seasonal variation in employment data for the construction industry in five European countries: the United Kingdom, Belgium, Poland, Denmark, and Germany. The analysis involves a careful inventory of the factors which influence seasonal fluctuations in construction employment and the calculation of regression equations in terms of the year-

to-year differences in seasonality as a dependent variable and meterological changes and changes in the cyclical level of activity as the principal independent variables.

The bibliography is divided into four parts: (1) mathematical statistics and correlation analysis, (2) methods of measurement and elimination of seasonal variation from time series, (3) seasonal variation in the construction industry from the economic and social point of view, and (4) seasonal variation in the construction industry from the point of view of technical methods of construction.

Although the method which Mendershausen advocates is more appropriate for many purposes than a constant index, caution regarding its use will occur to many readers. For the purpose of isolating the fluctuations in time series arising from purely seasonal factors which vary appreciably from year to year, this method has much to commend it. It may be questioned, however, whether unusual fluctuations of a seasonal nature can or should be completely separated from cyclical and other fluctuations, and whether it is correct to assume that each has an independent effect and that the total movement can be expressed as the simple aggregate of all the independent effects. For example, two or three severe winter months or a period of unusual drought or of heavy rainfall may influence not only the values for a given series at that particular time but may have a substantial effect upon the longer time trend. The complete elimination of seasonal influences thus may tend to yield a somewhat artificial residual series. Briefly, this method is likely to prove most useful in determining the causes of seasonal fluctuations but is much less suitable for the purpose of adjusting series to eliminate seasonal fluctuations.

Correlation analysis also is an expensive procedure particularly if multiple calculations are required and if an attempt is made to test for the significance of particular regression coefficients in terms of their probability of chance occurrence. The technique is inviting to research workers, but not all will have the resources necessary to carry it out. Nevertheless, in many instances, particularly in the special study of the causes of seasonal fluctuations themselves, the correlation method of measuring these fluctuations in terms of logically related factors may prove very useful and may fully merit the necessary expenditures.

The present situation in the development of these methods is neatly phrased by the author:

"Le problème lui-même n'est pas entièrement nouveau; mais la plupart de ceux qui l'ont reconnu n'ont pas encore entrepris les recherches nécessaires a sa solution; et ceux qui se sont engagés sur cette voie ne sont pas encore parvenus très loin."

Mendershausen, however, advances the argument to such a point that the measurement of variations in seasonality in terms of related influences no longer can be ignored by careful investigators.

LOWELL J. CHAWNER

Washington, D. C.

Growth of American Manufacturing Areas, by Glenn E. McLaughlin. Pittsburgh: Bureau of Business Research, University of Pittsburgh. 1938. Bureau of Business Research Monograph Number 7. xxvii, 358 pp. $3.00.

Dr. McLaughlin has done an important and useful task in extending back to 1869 the federal census figures for industrial areas, by retabulating census data and making some estimates from other sources. His purpose is a detailed comparison of the industrial development of the several areas, with special emphasis on the relative position of Pittsburgh.

Three measures of industrial growth are used: population, manufacturing wage earners, and value added by manufacture. The numbers *gainfully employed* can be only roughly estimated for years prior to 1930, because the proportion of population gainfully employed has wide regional variations, and also because it displayed a general rising trend before 1910.

Whatever measure is used, a retardation of growth in individual industrial areas appears characteristic as they approach "maturity." The familiar quasi-logistic growth curve appears again and again in Dr. McLaughlin's charts, and he usually has a satisfactory explanation for each upward surge.

One must of course view the implied law of industrial growth with some reservations. A supposedly "mature" area can be rejuvenated repeatedly by new technical developments, discovery of new resources, etc. Forecasts of continued slackening of growth in old areas are accordingly risky. But Dr. McLaughlin puts forward several arguments to show that the development of new industries—a major source of rapid regional growth—is more likely to flourish in relatively undeveloped areas. This applies particularly when the new industry is not imperatively localized by orientation to a concentrated market or to the source of a material, and when such factors as the relative conservatism of business leaders in the older areas can thus play a large part in throwing innovations to more virgin soil.

By means of an "index of instability" the author discovers that deviations from constant rate of growth are systematically greater in those industrial areas dominated by producers' goods and durable goods. This affords corroboration, then, of the thesis he advanced some years ago:[1] namely, that local specialization in durable-goods production, rather than specialization *per se*, is associated with large cyclical variations in employment.

The author elaborately analyzes the data for industrial areas, states, and cities, making feasible for the first time a real quantitative approach to the question of comparative regional growth rates and localization. The Pittsburgh area is given special attention throughout. His ratio-scale charts are so appropriate and effective that one wonders at the intrusion of some sets of relatives to the base 1899, charted on an arithmetic scale.

There is one serious statistical misstep in the book. On page 40, Dr. McLaughlin notes that, "surprisingly enough," over the period 1870–1930 the average rate of population growth for 25 "industrial or manufacturing"

[1] "Industrial Diversification in American Cities," in *Quarterly Journal of Economics*, Vol. 45, No. 1 (November, 1930), pp. 131–149.

states was considerably less than that for 23 "non-industrial" states. This classification of the states recurs from time to time in subsequent chapters. He has selected his "industrial" states, however, on the basis of *absolute* numbers of wage earners and *absolute* amounts of value added by manufacture; which leads to a rather peculiar list (p. 42). Texas, Iowa, Minnesota, Alabama, and Tennessee are thus classed as "industrial," while New Hampshire, Delaware, Maine, Vermont, and Oregon are "non-industrial." On the basis of the ratio of manufacturing wage earners to population, which might be a reasonable measure of degree of industrialization, I find the two groups of states above shifted to the opposite categories. Texas, for instance, ranks 15th in number of manufacturing wage earners (as of 1929), but only 43rd in ratio of wage earners to population; while New Hampshire ranks 29th in wage earners but 3rd in ratio of wage earners to population.

In a long chapter on "Reasons for Regional Differences in the Rate of Industrial Growth," the various locational factors accounting for the observed trends are set forth with clarity and some detail. This is a real contribution to our understanding of American economic geography, and merits the theorist's attention at several points.

Dr. McLaughlin measures the "suburban movement of manufacturing," but here the results are of less significance than they might be. He finds a general tendency for the central city of an industrial area to diminish in importance relative to the surrounding portion, and is careful to state that the data for cities are "adjusted wherever necessary for changes in city boundaries." But it is certainly not surprising that as an industrial community grows it should also spread, and spill out increasingly beyond any fixed limit area. Simply because the percentage of rate of industrial growth is more rapid in the suburban zone, we can by no means conclude that industry is becoming more suburban. Industry spreads to the suburbs, but at the same time the suburbs are becoming more fully urban. We must then look elsewhere for information as to whether the net result is a greater or a smaller degree of agglomeration.[2]

In his two final chapters the author considers the Pittsburgh district—first by its individual counties, and then as a unit in relation to rival districts. A fact partly responsible for this study, perhaps, is that the district has been showing the marked retardation of growth characteristic of "industrial maturity." In the decade 1920–30 there was a net emigration of population.

For the Pittsburgh district as a whole, its chief resources (coal, waterways, and gas) are seen as the basis for continued slow growth along present lines of specialization. In steel production, according to Dr. McLaughlin, the Chicago district has only the temporary advantage of more modern equipment. His forecast is that the Pittsburgh district will remain a cyclically-sensitive coal and steel district, and must face the long-run handicaps of

[2] Incidentally, it seems surprising that Dr. McLaughlin ignores several previous statistical studies of industrial and human migration, notably Daniel B. Creamer's *Is Industry Decentralizing?* (Philadelphia: University of Pennsylvania Press, 1935); later incorporated in the final report of the Study of Population Redistribution, entitled *Migration and Economic Opportunity* (1937).

competition from newer coalfields, increased economy in the use of coal by industry, and the growing substitution of scrap steel for pig iron. The aluminum, electrical-equipment, and glass industries are growing more rapidly, but have only a minor influence on the growth trend of the area. If retardation of growth is not to continue, there must be a steady infusion of additional new industries.

EDGAR M. HOOVER, JR.

University of Michigan

Tables of the Ordinates and Probability Integral of the Distribution of the Correlation Coefficient in Small Samples, by F. N. David. London: Issued by the *Biometrika* Office, University College, and printed at the University Press, Cambridge, England. 1938. xxxviii, 55 pp.

The title of Miss David's *Biometrika* office monograph will practically suffice as its review. The book is about equally divided between text and tables, the text containing good theoretical discussions of the principles by which the theory of probability may be used as a guide in drawing inferences from observed correlations, plus a liberal sprinkling of examples which demonstrate each use of the tables.

R. A. Fisher in 1915 gave the probability distribution of r in samples of n from a normal population with correlation ρ. By the next year Karl Pearson was already planning the presentation (in *Biometrika*, 1917) of this information in tables of ordinates and photographs of models of the r distribution for different n and ρ.

Of course Fisher's logarithmic transformation of r provides an almost normally distributed z, but Pearson, seeking even greater accuracy, asked Miss David in 1931 to prepare the tables of the probability integral here presented.

The tables are given for successive sample sizes from $n=3$ to $n=25$ and then for selected larger samples, $n=50$, 100, 200, 400. Tabular values are presented for each population coefficient ρ at 0.1 intervals from $\rho=0.0$ to $\rho=0.9$, and for each sample coefficient r at 0.05 intervals from $r=-1.00$ to $r=+1.00$. Even smaller intervals of r are taken near $r=+1.00$, for $\rho=0.9$.

Miss David describes in some detail the construction of her tables and the methods of their interpolation; and she indicates their use in solving the following types of problems:

1. Are the observed data in a sample consistent with the hypothesis that in the population,

$$\text{(i) } \rho \geqq \rho_0, \quad \text{(ii) } \rho \leqq \rho_0, \quad \text{(iii) } \rho = \rho_0$$

where ρ_0 is some specified value?

2. How may the observed data in a sample be used to the best advantage in order to calculate limits ρ_b and ρ_a, such that the statements

$$\text{(i) } \rho_b \leqq \rho \leqq +1, \quad \text{(ii) } -1 \leqq \rho \leqq \rho_a, \quad \text{(iii) } \rho_b \leqq \rho \leqq \rho_a,$$

regarding the unknown value of ρ in the population sampled may be made with given degrees of confidence?

3. Suppose we have k $(k \geqq 2)$ independent randomly drawn samples. Are the observed data consistent with the hypothesis that in the k populations sampled the coefficients of correlation, $\rho_1, \rho_2, \cdots \rho_k$, are all equal to

   (i) a specified value, ρ_0,
   (ii) a common but unspecified value, ρ?

An appendix provides an excellently clear, straightforward derivation of the distribution of the correlation coefficient for any n and ρ, for samples drawn from a normal bivariate population.

The charts, giving the results of the tables for selected sample sizes and confidence limits of 0.10, 0.05, 0.02, 0.01, serve the important purpose of providing ready reference to approximate answers.

The reviewer feels that, although Miss David deserves great praise for such a tremendous compilation well done, she has earned even greater acclaim for having restated a portion of R. A. Fisher's work in such a manner as to make it definitely intelligible. Her treatment of the risks of rejecting a true hypothesis along with the risk of accepting a false one is both lucid and stimulating. If, as E. S. Pearson says in an editor's preface, the study of correlation is "not merely toying with an interesting historical relic of the past," Miss David's volume is indeed a valuable contribution.

FRANCIS MCINTYRE

Cowles Commission for Research in Economics,
and Colorado College

Mathematical Tables, Volume VI, Bessel Functions, Part I, Functions of Orders Zero and Unity, Prepared by the Committee for the Calculation of Mathematical Tables, British Association for the Advancement of Science. Cambridge: University Press. New York: The Macmillan Company. 1937. xx, 288 pp. $14.

The major part of this volume (170 of the 288 pages) is devoted to the tabulation of the values of the basic Bessel functions $J_0(x)$ and $J_1(x)$ by intervals of .001 from $x=0$ to $x=16$ and by intervals of .01 from $x=16$ to $x=25$. All these values are given to ten places of decimals. Also included are the values from $x=0.00$ to $x=25.00$ of functions $Y_0(x)$ and $Y_1(x)$ which are independent solutions of the Bessel differential equation for the cases $n=0$ and $n=1$, the values from $x=0.000$ to $x=5.000$ of the functions $I_0(x)$ and $I_1(x)$ which are solutions of the differential equation

$$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - (x^2+n^2)y = 0$$

for $n=0$ and $n=1$, and the values from $x=0.00$ to $x=5.00$ of functions designated as $K_0(x)$ and $K_1(x)$ which are independent solutions of the same equation, as well as the values of the arguments at the first 150 zeros of $J_0(x)$ and $J_1(x)$ together with the values of the other function for the same argument, and similar tables for the first fifty zeros of $Y_0(x)$ and $Y_1(x)$. In addition to the main tables, there are tables of interpolation coefficients, differences of the tabulated functions, and auxiliary functions useful for purposes of interpolation.

The following features seem worthy of special mention:

(1) A complete explanation of the methods used in calculating and checking all values.

(2) A concise summary of the definitions and principal mathematical relationships of the various functions tabulated, including asymptotic series for their calculation.

(3) A systematic tabulation of the various notations which have been used by different authors in connection with Bessel functions with their equivalents in terms of the notation of the present volume.

(4) Complete tables of all the values needed for interpolation in any range including values of the coefficients in various interpolation formulae. In those ranges where interpolation by the usual formulae is not satistactory, values of interpolable auxiliary functions are tabulated, with instructions for obtaining from them the corresponding values of the original functions.

All values are given to at least seven decimal places; most of them to eight or ten. The arrangement of the tables is excellent, the printing is unusually clear, and the precautions taken to insure accuracy would seem to justify the belief of the compilers that the tables are "completely free from error." After a most careful examination of the book I can find nothing to criticize, and it is certain that this volume will be a boon to all who have frequent need of values of Bessel functions.

T. N. E. Greville

University of Michigan

Primary Mental Abilities, by L. L. Thurstone. Chicago, Illinois: The University of Chicago Press. Psychometric Monographs, Number 1. Published for the Psychometric Society. 1938. ix, 121 pp. $2.00.

We have, in this study, an illustration of the practical import or working out upon quite extensive data of the author's techniques and point of view, as earlier given in his "Vectors of Mind" and collateral studies.

The author was able to administer 56 tests to a group of 218 students of a slightly superior college level of ability. These were then analyzed by the author's centroid method and axes rotated in line with his "simple configuration" concept to yield final vectors, or mental factors.

It is corroborative of earlier analyses made by the author and others,

even though reliability coefficients or standard errors of vector constants are lacking, that four nearly independent vectors, a Spatial factor, a Numerical factor, a Verbal relations factor, and a Memory factor, are dimensions which can be used in the analysis of the mental ability of students at this level. The author does not report the correlation between factors, but these may be estimated from his Table 4.

The author finds a Perceptual factor fully entitled to rank with these four in importance, and a number of smaller factors, two of which, Word Fluency and Inductive Reasoning, are, in his judgment, trustworthy. In view of the lack throughout of probability tests of significance, the reviewer cannot share the author's confidence in all these factors, but he does consider the existence of a Perceptual factor highly presumptive and worthy of serious consideration. One argument that this factor is a discovery is that it is not so obviously dictated, as were the Spatial, Numerical, Verbal, and Memory factors, by employing in the initial test battery many tests heavily loaded with it. Unfortunately its substantial correlation with the Spatial factor militates against its usefulness.

Though the finding of the four-mentioned factors can hardly be called a discovery, as the initial tests were so chosen as to be heavily loaded with them and the "simple structure" procedure of the author necessitates that they be rediscovered in the factors, provided only that the mental operations, simple or complex, represented by the tests exist and can be fairly reliably measured, nevertheless the relative independence between them is an experimental finding. This independence could not be there unless it was first in the psychic structures of the individuals tested.

Comment as to certain techniques is in order. The author provides an empirical function, on page 66, for determining the number of significant factors to be extracted. No standard error is provided for this function, and it takes no account of whether factors are correlated or independent, an item which the reviewer would believe to be inherently pertinent, but since it is admittedly empirical it must be left to the test of usage.

To those who anticipated working with Dr. Thurstone's extensive test data and checking and reworking analyses, the greatest disappointment is probably in the fact that tetrachoric correlations were used throughout. Dr. Thurstone has followed this procedure not only to economize time, which should hardly have been necessary as only 1540 correlation coefficients are involved, but also to normalize his distributions. This intent seems most commendable. Dr. Thurstone notes that the distribution of raw scores is essentially arbitrary, and any skewness found therein cannot be taken as reflecting a skewness in the distribution of talent. "Hence," he states, "in using tetrachoric coefficients, we are estimating the product-moment coefficient for the normalized distributions of scores." This seems plainly to be a serious error. It is a simple matter to construct two correlated skew distributions, normalize each, calculate the product-moment correlation coefficient from these normalized scores, and observe that this coefficient

differs materially from the tetrachoric correlation coefficient. For tetrachoric r to equal product-moment r, not only is normality of marginal totals necessary but also linearity of regression and homoscedasticity of arrays. Neglecting these last two conditions leads to consequences which are, or at least may be, quite disastrous. The tetrachoric correlation matrix may contain impossible or inconsistent values, and any attempt to factor and then apply sampling theory and determine standard errors of constants derived is undermined at the start, for all theory so far developed, including Dr. Thurstone's, assumes consistent product-moment correlation coefficients. That so fine a body of original test scores cannot be used in this manner is an occasion for, shall we say, psychometric sorrow.

The reviewer, upon a second reading of the sections dealing with the nature of the population sampled, has been unable to find any statement as to the sex distribution of the subjects tested. If all the subjects are of one sex, this is just an unhappy oversight upon the part of the author, but if they are of both sexes it is more serious, for sex is itself a vector of first importance which should be "partialed out" before further analysis is attempted. [The reviewer admits that he himself has been derelict upon this very point.]

The cleverness which has been shown in the construction, adaptation, and selection of tests, and in securing rapport of subjects, leads the reviewer to express the hope that the author will still make available product-moment correlation coefficients for all the variables used, and for sex and age in addition. Though the reviewer believes there is much of suggestion and even permanent value in this study, nevertheless the demonstrable value of a study in a moot field lies in its fortification of crucial statistics with distributions or at least standard errors and in the amenability of its basic data to verificatory examination by others using sound and, if possible, different methods.

The psychologist concerned with the practical problems of guidance, as well as the psychometrist concerned with the general problem of mental analysis, will find this study rich in suggestion.

TRUMAN L. KELLEY

Harvard University

Narrenspiegel der Statistik. Die Umrisse eines statistischen Weltbildes, by Ernst Wagemann. Hamburg: Hanseatische Verlagsanstalt. 1935. viii, 255 pp. RM 7.50.

What statistician has not been told that anything can be proved by statistics, and that there are "liars, damn liars, and statisticians?" The author of this book, professor at the University of Berlin, chief of the Institute of Economic Research, and formerly head of the German Central Bureau of Statistics, heard these remarks once too often. Moved by a holy

indignation, the inspiration came to him to write something that would form an answer to the constant "defamatory statements about a science which is fundamental to political and economic administration." Only one method seemed suitable for this purpose, namely to expose the existence of a strict system of statistical sins—counterfeit concepts, contradictions in analysis, and erroneous conclusions drawn from statistical data. The result was this book, a "Fool's Mirror of Statistics" which, according to the wrapper, "shows how it pleases an honest Public to poke fun at Statistics and how even an honest Purpose often misses its Goal and in which, to the deterrence of Statistical Sins and to the Relief of all Good People there is shown that although Deceit and Wilfulness can prove anything by Statistics, everything turns out for the best in the End."

This quotation should not mislead the reader into believing that here is an essay of inconsequential nature. On the contrary, the book is a brief treatise on the theory of statistics. It gives in systematic form a discussion of statistical groups as expressions of logical concepts; it deals with the problems involved in securing data; it treats at length the questions of correlation and sampling techniques, index numbers, statistical prognosis, etc.; in short, all the fundamental aspects of statistics are covered. Throughout the presentation the author points to possible sources of errors and, from his rich experience and wide knowledge of the sources and literature of economic and vital statistics, he draws ample illustrations of bad as well as good statistical procedures. The style is lively, punctuated by humor and at times rising to poetical heights not ordinarily scaled by writers of statistical works. All in all, the book is an excellent introduction to statistics and should be required reading for all students. The seasoned statistician would derive both pleasure and profit from it. It deserves to be translated.

THORSTEN SELLIN

University of Pennsylvania

Duodecimal Arithmetic, by George S. Terry. New York and London: Longmans, Green and Company. 1938. 407 pp. $7.50.

Some college algebra textbooks treat briefly of other systems of notation than the decimal and mention the advantages which would have arisen if primitive man had had six fingers on each hand and thus had been led to develop a duodecimal system. It has remained for Mr. Terry to do a really thoroughgoing job in this field. In a quarto volume of 407 pages (or *29E* in his notation, where E[1] represents "el" or 11, and the whole is equivalent to $2\times144+9\times12+11=407$ in decimal notation) he presents a multiplication table (an addition table would have been useful also), conversion tables, tables of factors, powers, roots, and reciprocals, and a number of other tables for common needs. More than three-quarters of the book is taken

[1] Actually in Mr. Terry's facsimile-typewriting book, the figure *3* upside down is used for "el." A capital *X* is used for "dec" or 10, while *10* represents "do" or 12. Ready distinction between the two systems is attained by printing decimal figures in the ordinary form and duodecimal ones in italics.

up with tables of the natural and logarithmic trigonometric functions to nine duodecimal places, for arguments to four-place duodecimal fractions of the whole circumference, which is taken as the angular unit; and with tables of the nine-duodecimal-place logarithms of numbers from *1* to *EEEE* (1 to 20,735 in decimal notation). In addition there are brief tables of digamma, Bessel, and interpolation functions.

It is an imposing piece of work, and Mr. Terry has rendered a great service to pure mathematics in making it available. He points out in his introduction the considerable simplification of many arithmetical operations which would result from the use of the duodecimal notation; and that machines could readily be made to carry by 12's instead of by 10's if there were a demand for them. The reviewer tried a number of arithmetical examples by both systems, and, with no preliminary practice and without learning the new multiplication table, took less than three times as long with the duodecimal as with the decimal notation. Undoubtedly practice would soon bring proficiency.

The book might well be used in high-school and college classes to provide supplementary work for brighter students. In time, this would produce a generation of mathematicians to whom the notation was familiar and who might find it useful for certain work. Whether the system can ever be more widely adopted seems doubtful, in view of the resistance met by much less fundamental reforms such as the metric system or the World Calendar.

Dickson H. Leavens

Cowles Commission for Research in Economics

An Introduction to Business Statistics, by John R. Stockton. Boston: D. C. Heath and Company. 1938. v, 378 pp. $3.00.

Laboratory Manual for Business Statistics, 1938–1939 Series, by John R. Stockton. Austin, Texas: Hemphill's Book Store. 1938. v, 97 pp.

This text and accompanying laboratory manual are additions to the rapidly growing "Introduction to Statistics" family, which necessitates considerable care to determine wherein the additions differ from the older members.

The author says of his text: "This book is not designed to train statisticians but to familiarize students—with the most common statistical methods—and to make them conscious of the importance of statistical data and its analysis in the management of business enterprise." To attain these objectives he "covers the topics usually considered in a first course in business statistics," he places emphasis "on the way in which the different statistical techniques are actually employed in business," and he includes 47 short problems in the text and 30 longer problems in the manual "to give students practice in computing the different statistical measures, and experience in using data and analyses in the forming of business judgments."

Some 80 pages are devoted to introduction, to secondary sources (Business

Barometers), to collection, and to classification and tabulation. In the reviewer's opinion the chapter on Business Barometers should appear within the first rather than within the last 50 pages.

The 35 pages devoted to tabular and to graphic analysis satisfactorily present the fundamentals of these topics. But the reviewer feels that the sections dealing with the graphic analysis of the time series and perhaps those concerned with correlation charts should be included in the chapter on charting.

The numerical analyses (averages, dispersion, and correlation) require some 80 pages. To "familiarize students with the most common statistical methods" this general section should have included chapters on ratios and on the unreliability of statistical numbers, for the former is commonly used (and abused), and the latter is essential to a complete understanding of the numerical measures.

The analysis of the time series (some 115 pages) is very well done. The forces affecting this series are discussed. The numerical analysis is elementary and emphasizes the meaning of and the uses of such derived numbers.

The discussion of the construction of index numbers of business activity is presented within 15 pages. The reviewer has long felt the need of including such a discussion in an elementary text. But he wishes the chapter had shown the relationship in construction between a business activity index and a price index more clearly, since the problems in the text and in the manual are concerned with the latter.

The 47 short problems, appearing as an appendix, are excellent. They should prove to be interesting, for the data are drawn from many sources, and many of the questions are so stated that the student must use his judgment in answering.

Of the workbook, which includes the necessary tabular and graphic blank forms, the author says he "deliberately introduces somewhat complicated situations in which the figures do not always 'come out even' and in which the analysis of the data and the conclusions may be somewhat bewildering." The problems, however, "attempt to present realistic situations, the solution of which requires real data." Lastly, the forms are not complete in every detail, "for the setting up of columns with their proper captions is an important part of the working problem."

The 10 problems dealing with the numerical analyses and the 13 with the time series are not likely to be found too complex for the beginning student. Several of the problems may be shortened by omitting the parts involving repetition of procedure. The problems concerned with index numbers and with correlation are least satisfactory, the former because only four commodities and four years are involved and the latter because only simple linear correlation of ungrouped data are analyzed. Since formulas or unique symbols are omitted, the workbook may be used with any introductory text.

In summary of both text and manual, the reviewer noted on the one hand that the text lacked organization in part (which is a matter of opinion),

that it was incomplete in part, and that it was distinctly elementary (which is not a fault); and, on the other hand, that stress was placed upon the meaning of and the uses of statistical numbers and that the problems were excellent. He drew the conclusion that the text had several shortcomings. The volumes have their place, however, in the family of which they are members.

CLAUSIN D. HADLEY

Indiana University

Nassau Senior and Classical Economics, by Marian Bowley. London: George Allen & Unwin, Ltd. 1937. 358 pp. 15 *s*.

This doctoral dissertation from the London School of Economics is of remarkably high quality—actually unique in the field of history of doctrine (in the reviewer's judgment) for the combination of scholarly breadth and accuracy with analytical insight. The six chapters of Part I, on "Economic Theory," fill three-quarters of the text and present a rounded treatise on the thought of the Classical School, with Senior as a point of orientation, together with immediate background and the main French and German writings in the same tradition. Part II (pp. 237–339) deals more explicitly with Senior, under the two heads of governmental policy and the poor law problem. This section, although dealing with matters of perhaps equal importance, gives somewhat the impression of a let-down, partly because of the nature of the subject matter and partly because the first of the two chapters is in some measure a repetition of the first chapter of Part I, on "Scope and Method," and this is the weakest of the chapters on theory.

The main limitations of the work, as regards appeal to a wide circle of readers and use in university courses, seem to be, first, that it presupposes a very great deal, both in knowledge of the literature of economic theory and in grasp of its problems. It is not a book for elementary students. In the second place, the author leaves her own position unstated, with the result that the reader finds it difficult or impossible to tell what is her conception of advance in the field, or the nature or magnitude of Senior's "contribution." This is not necessarily a defect, since the alternative is nearly certain to be writing the history of doctrine in terms of the writer's own doctrine as the goal of progress; but the consequences of either procedure must be recognized and accepted. The historical approach to any division of intellectual or cultural history is sharply different from that of the special student in the field itself.

The book shows numerous examples of carelessness in final revision and proofreading, especially in the earlier parts. For example, on the same page (74) the first sentence contains a superfluous "that," and the first footnote gives the title of Ricardo's main work when that of Adam Smith is obviously meant. The Index gives only proper names and is imperfect (note fusion of the elder and younger Keynes under the name of the latter, usage in the

book being correct), whereas indexing of subjects would be highly valuable. As Professor Viner has pointed out (*Economic Journal*, June, 1937), the bibliography of Senior's published and unpublished works (Appendix II) contains errors in detail. None of these criticisms or suggestions seriously modify the judgment that Dr. Bowley has written a book of extraordinary merit.

FRANK H. KNIGHT

The University of Chicago

New Fashions in Wage Theory: Keynes, Robinson, Hicks, Rueff, by Jürgen Kuczynski. London: Lawrence and Wishart. 1937. viii, 99 pp. 3/6.

This book is a collection of statistical essays written from the Marxian point of view. In the first part, the wage theories of Rueff, Keynes, and J. R. Hicks are subjected to critical analysis. Mr. Kuczynski easily shows some of the superficialities in Rueff's contention that increases in real wages cause unemployment, while decreases lead to increased employment. He correctly points out that Rueff's index of real wages was erroneous, since it divided money wage rates by the wholesale price index, whereas he should have used an index of actual earnings and one of the cost of living. Rueff, therefore, employed a price index which was more flexible than the facts warranted and an index of wages which was less flexible. Working with more accurate statistics for Germany for the years up to 1932, he finds Rueff's figures disproved until at least the beginning of the great depression.

In dealing with Mr. Keynes' wage theory, he correctly points out that it is based upon a desire to hold money wage rates constant but to increase prices through monetary management, thus decreasing real wages and sending up the return to management in order to overcome the liquidity preference and stimulate investment. This, however, is only true within the business cycle when there is a considerable volume of unemployment. Kuczynski goes on to state that Keynes' lucid interpreter, Mrs. Robinson, wants to preserve a moderate margin of unemployment so that money wages may, indeed, not rise too high, and so that the deflation of real wages and the enhancement of entrepreneurial gains may, in fact, occur.

From these writers, as well as from Mr. Hicks' gloomy views about the dangers of increasing wages, Mr. Kuczynski implies that the nonsocialist wage theorists can offer no hope to the workers within the framework of capitalism and that their program for prosperity is merely to cut wages, whether openly or covertly. He, therefore, classes these economists as the witting or unwitting protagonists of Fascism. The conclusion is drawn that only a new and socialized order of society can improve the position of labor.

It is small wonder if Mr. Kuczynski does not recognize that Keynes' wage policy is intended primarily to apply within the business cycle and is not necessarily intended to govern long-time movements of wages. It is in terms of the long run (at least up until 1929) that capitalism has given great gains to labor. What Kuczynski and some of those whom he criticizes

neglect is that wages may increase through time, and in the past have done so, because of increased marginal productivity. This, in turn, has been caused by: (1) a growth in the rate of capital which has exceeded the relative increase of labor, and (2) by technological advance as well. These factors are surely more important in the long run as determinants of wages than the rather strained short-time explanations which are advanced by those who are obsessed with the all-importance of monetary policy.

Despite Mr. Kuczynski's keen analysis of the statistical inadequacies of the wage theories of other writers, he lets his own zeal get the better of him when it comes to his essay on "Wage Averages Within a Capitalist Organism." By lumping together the British and Indian textile industries, he comes to the conclusion that real wages have decreased; and the Marxian contention that the condition of the workers undergoes progressive deterioration from one major trade cycle to another is confirmed. If, however, he had taken the statistics for all workers within Sweden, Great Britain, and the United States as computed by Bägge and his associates, by Bowley, and by the present reviewer respectively, he would have found a long-time and fairly steady increase in real wages.

Paul H. Douglas

University of Chicago

Introduction a l'Economie Dirigée en sept leçons, by Dan Radulescu. Paris: Librairie des Sciences Politiques et Sociales, Marcel Rivière. 1937. 128 pp. 18 fr.

The title is misleading and the book a complete disappointment. Devoid of thorough analysis and failing to transmit an appreciation of the complexities of the problems involved, this book is milk and water even for high-school juniors. Still worse, it is a storehouse of error, misinformation, and prejudice against economists, bankers, and financiers alike. Over half of the book deals with introductory descriptions of the rudimentary features of capitalism, and the author, a professor in the University of Cluj, skips in sprightly style from topic to topic, mentioning a theory here, citing a fact there, seeing flaws everywhere and smartly charging them to the stupidity of economists or the cupidity of bankers. In the remainder of the book Professor Radulescu offers a brief outline of his favorite schemes, moving with naive ease from quarter to quarter of his blueprint, lightly brushing away all difficulties, and applauding his own propositions with the praise that they are "simple, logical and lucid," adjectives which recur with monotonous frequency throughout the book.

Let the work, through a few examples, speak for itself. Supply and demand, the author claims, express only a "statistical rule," but are "pompously called a fundamental law" by economists (p. 19). Monopoly "is the exclusive right to exploit a given economic field which the state reserves for itself or confers upon a particular institution" (p. 23). The price of a good is "only a conventional and arbitrary relationship established between ob-

jects" (p. 28). The quantity theory of money is one of "the most amusing and most fallacious theories." It equates the value of money to P/N, where P is "the sum of the prices of all objects expressed in gold" and N is "the amount of money issued." This theory is "crudely false" because it neglects credit (pp. 33–35). "According to the conception of Ford as well as modern sociologists," the function of industry and commerce is to render service to society (p. 81). Nothing should be imported by a country except what cannot be produced within it (p. 84). Tourist expenditures abroad occasion "considerable loss" to the home country inasmuch as it will be obliged to pay for their expenditures with exports "without receiving anything in exchange" (p. 99). The list can be extended, and the pages dealing with a planned economy are scarcely informed with greater competence.

M. M. BOBER

Lawrence College

Entwicklung und Strukturwandlungen des englischen Aussenhandels von 1700 bis zur Gegenwart, by Werner Schlote. Jena, Germany: Verlag von Gustav Fischer. 1938. Probleme der Weltwirtschaft, Schriften des Instituts für Weltwirtschaft an der Universität Kiel. Herausgegeben von Andreas Predöhl. Vol. 62. viii, 182 pp. RM 10.—(in paper cover).

For many years the Kiel Institute of World Economics has enjoyed a high reputation for its scholarly, realistic contributions to the science of international economics; today one has reason perhaps to add: contributions to the international science of economics. Together with a complementary new publication by the Institute (*Wachstum und Wachstumsformen der englischen Industriewirtschaft*, by Dr. Walther Hoffmann), the present volume will certainly prove that the Kiel Institute continues to be one of the most important centers of economic research the world over. Granting that some of the results of a very considerable amount of patient statistical work might still be improved, granting furthermore that a thoroughgoing economic and historical analysis of the material presented has yet to be made, this reviewer wants to emphasize that Dr. Schlote's study fills an important gap in our literature and will prove not only helpful but indispensable in further research. As a contribution to a comprehensive long-period analysis of English capitalism, the book presents and describes with great skill very long series of statistical data concerning English exports, imports, and reexports. These data are sufficiently differentiated as to commodity groups and to the direction of foreign trade, the latter with special regard to trade relations within the Empire. The earlier parts of these series are, of course, not completely reliable. Taken merely as indicating orders of magnitudes, however, even these figures are of great help in any quantitative trend analysis.

The book opens up with a "methodical section" which describes first the nature of the statistical material and then the methods applied to overcome

serious difficulties and to connect various segmental series into long continuous series. Aside from changes in the extent of the British territory, the most important difficulty is created by the curious fact that English exports from 1696 until 1798 and imports and re-exports from 1696 until 1853 were evaluated only on the basis of "official" prices; most of these, however, were prices actually prevailing in 1694 and were never revised during the whole period of approximately 100 and 150 years respectively. In his attempt to get at the "real" (actual) values of the various subgroups of imports, etc., for as long a period as possible, Dr. Schlote takes a roundabout way over the computation of trade "volumina," i.e., adding up quantities of different commodities traded in consecutive years by weighting each commodity always with the same price through a more or less long period. The problems involved in this procedure, its merits and limits, are discussed briefly but very clearly. The obvious shortcomings—which are best illustrated by the official English evaluation method just referred to—are greatly reduced by breaking up the whole long period of 1820–1934 into seven subperiods, for each of which the price weights are changed. One might wish an even greater refinement; the possible gain, however, would very probably not warrant the additional labor required. In order to find the actual ("real") values of imports and re-exports at least for the period 1800–1854, the author uses the respective figures for "volumina" and applies to them Jevons' index numbers of wholesale prices. (Consequently, for this period no absolute figures for actual values but only index numbers are produced.) The reliability of this method should be checked sometime by using recorded actual prices for individual commodities, at least for some few test years. Jevons himself, Tooke-Newmarch, and Sir William Beveridge's forthcoming history of English prices would probably provide sufficient data.

The results of Dr. Schlote's statistical research are collected in an appendix of about 70 pages, which also contains a short paragraph on the development of English food tariffs in the nineteenth century. The second chapter of the main text analyzes these data with the help of many graphs and tables which usually reorganize the statistical material in terms of quota or relative shares. This method brings out very well changes in the relative position of the various items but tends somewhat to obscure the fact that a heavy decline in relative shares might still be compatible with an absolute increase in value or volume of a given group of commodities. Occasionally the author himself cautions the reader. Even within the limits of this descriptive study, however, it might have been worth while to emphasize the great significance of the fact that, in contradistinction to the postwar period, all the major readjustments which the English economy had to undergo during the nineteenth century almost never implied any absolute decline of major industries. This fact helps to explain the relative severity of the English postwar structural crisis. One might also criticize that in many tables and diagrams the series break off with depression data and neglect the remarkable revival also of English foreign trade in the last few years. Finally, the present

writer would have welcomed an even more careful use of export-import price ratios. These are very minor points, however, in view of the extremely lucid presentation of all the main developments in English foreign trade. Especially interesting is the correlation of foreign trade series with Dr. Hoffmann's index of industrial production.

The effects of Sir Robert Peel's free trade policy and of the later industrialization of continental Europe and oversea countries are brought out very clearly.

In general the author refrains from any causal analysis which would involve theoretical consideration as to possible relationships and even more from any political evaluation. At every step, however, the reader feels that Dr. Schlote was well aware of all the important problems to whose solution his empirical work might contribute.

GERHARD MEYER

University of Chicago

Business and Modern Society, edited by Malcolm P. McNair and Howard T. Lewis. Cambridge: Harvard University Press. 1938. viii, 411 pp. $5.00.

This is a collection of 14 papers by members of the faculty of the Harvard Graduate School of Business. According to the preface and the pronouncement on the jacket the papers are addressed primarily to business men in their thoughtful and reflective moments and only incidentally to economists in their professional capacities. The topics dealt with range from such very broad and general questions as Dean Donham's essay on "Material Progress and Social Discontent" or Professor Isaac's on "The Logics of Public and Private Administration" to quite specialized and "practical" ("ideas-I-can-use-in-my-own-business") themes such as Professor Walker's paper on "Some Recent Experiments in the Control of Manufacturing Costs" or Professor Roethlisberger's "Understanding: A Prerequisite of Leadership." Moreover, some papers aim to summarize for the business man the results of recent thought and investigation on particular questions, e.g., Professor McNair's "Business Cycle Theories: Some Comments for the Layman," while others such as Professor Hubbard's "The United States Federal Debt, with Special Reference to Bank Holdings and Monetary Control," present rather the findings and conclusions of original investigations. All these and Professor Gras' brief summary of "The Historical Background of Modern Price Regulation" make interesting and suggestive reading. As the titles indicate there has been no effort to have the papers revolve around any common theme; and the title of the volume would have been more descriptive of its contents had the phrase "some aspects of" been prefixed to it.

From the point of view of the economist and statistician the papers are of varying degrees of interest. In view of recent studies they will doubtless welcome Professor Hosmer's paper on "The Effect of Direct Charges to Surplus on the Measurement of Income." It is not as generally appreciated

as it should be that the reported net incomes of business corporations are in the nature of a rough guess predicated on certain assumptions with respect to the appropriate methods of valuing durable assets. Professor Hosmer emphasizes that even this figure is open to arbitrary variation within wide limits because of the very loose practices governing the assignment of charges between capital and income. This is no minor matter, in view of the (apparently) great significance attached to reported earnings by investors, business men, governmental agencies, and buyers and sellers in the capital market generally. All manner of important decisions are apt to be made on reported earnings as an aggregate, or as a percentage of past historical investment, as though such figures were precise, accurate, and comparable between years and between corporations. Seemingly intelligent people are willing to "believe in" and act upon reported net income figures at the same time that they disdain to attach much importance to balance sheet statements. Yet it is surely not open to dispute that any error in the one is by the same token an error in the other.

Somewhat similar problems are considered in Professor Sanders' paper on "Proposed Reforms of Accounting," although his main concern is with the recently circularized statements of "accounting principles," the accounting regulations of state and Federal administrative agencies, how these have been interpreted and applied in practice, and the results thereof. Although he finds much to criticize with respect to all these, his points are frequently well taken. In other cases, however, the reviewer doubts very much if equally competent authorities would concur with his strictures (e.g., pp. 79, 81, 83–85). Indeed some of Professor Hosmer's remarks in the paper already mentioned appear to be flatly contradictory on certain points of accounting theory. On the whole Professor Sanders seems to be much more certain than his colleague of the basic "soundness" and usefulness of some of the time-honored "principles" of accounting.

Professor Slichter's paper, "The Adjustment to Instability," deals with the highly important question of profit expectations and their determinants. Profit expectations are improved by cost reductions on the assumption that prices and sales volume are maintained or do not fall as much. But this is precisely the dilemma. A cut in wage rates, for instance, may either increase or decrease the total wage bill depending upon the elasticity of demand for labor *if* we may assume that the demand schedules for products are unaltered. In dealing with one enterprise or one industry such an assumption does not do much violence to the facts. But in treating the whole economy one cannot assume that consumers' outlay will be unchanged with a reduction in wage rates. Slichter makes certain distinctions between immediate and longer-run results and emphasizes the importance of relative rates of change; but he is apparently skeptical of the efficacy of wage-cuts alone. He writes (pp. 253–54): "The point which I wish to emphasize in particular, and which is the essence of my argument, is that neither reductions in cost-determining prices nor support of markets is enough. *In fact, each alone is*

dangerous. Each needs to be supplemented by the other." (Italics in the original.) There are few questions in economics of greater importance than that of the relative merits of wage-rate maintenance or wage-rate cuts as a depression policy. And it is probably not inaccurate to say that among economists there is no consensus as to the proper policy to be followed. Slichter believes wage cuts are an almost indispensable aid to revival, and his reasoning is provocative and sometimes novel; but doubtless he would be the first to admit that he has not said the final word. Parts of the analysis seem a little tenuous; and at one point (pp. 245–46) there appears to be a confusion between funds and flows; but this may be because the full assumptions are not stated explicitly. In any case there is no question of the importance of the problem, and it is encouraging to find an economist in the field of labor addressing himself to it.

Other interesting papers included in the volume on which space limitations permit no comment here are: "Logics and Emotions in Marketing," by Professor Teale; Professor Tosdal's on "The Study of Consumer Demand in Relation to Capitalistic Society;" Professor Malott's paper on the agricultural problem; and one on "Rate Making and Marketing Problems of Public Utilities," by Professor Ruggles.

This is a useful collection of essays which economists and statisticians will wish to sample and reflect upon according to their tastes. And it is perhaps unnecessary to add that the reviewer's distribution of emphasis among the papers is not to be interpreted at all as reflecting his estimate of their relative merits.

NORMAN S. BUCHANAN

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Industrial Price Policies and Economic Progress, by Edwin G. Nourse and Horace B. Drury. Washington, D.C.: The Institute of Economics of The Brookings Institution. Publication No. 76. 1938. xi, 314 pp. $2.50.

Carrying on the thesis of Moulton's *Income and Economic Progress*, Messrs. Nourse and Drury consider the circumstances under which and the extent to which the business manager can contribute to national welfare by low-price policies. Their volume seems to be addressed primarily to business men, but its forceful challenge to accepted views of the problems of monopoly requires the serious attention of economists.

The book presents a vigorous sermon to executives of large corporations, delivered by friendly but thoughtful critics. The theme runs as follows: Since in many fields of manufacturing, maximum economy and progressiveness require very large units, executives are endowed with power over market forces. Their choice of policies determines how nearly capacity output and employment are approximated in the long run. (The book is not concerned with problems of the business cycle.) Restrictionist policies, attractive for

temporary profits, are likely to prove illusory as instruments of long-run gain and are, in any event, antisocial. Only through continuous progressive improvements and price reductions can the system of free enterprise under private capitalism realize its great potentialities. Since the World War a growing number of business men have adopted constructive low-price policies implemented by ingenious advances in technique or organization, of which numerous examples are given; but many other business men, understanding imperfectly their long-run advantage or their social responsibilities, continue to pursue restrictionist policies. The text of the appeal addressed to these is, to paraphrase: be good, big boy, and let who will be high-priced.

The book opens with brief statistical surveys suggesting that workers' real purchasing power for manufactured products grew much more rapidly in the two periods 1870–92 and 1918–37 than in the intervening period of flowering trusts, and that since 1918, at least, manufacturing profits have not increased more rapidly with rising prices than with moderately falling prices. The middle portion of the book is then devoted to exploration of the sorts of changes in quality, type of goods, processes, scale of organization, and pricing policy which result in satisfying more wants at prices within the incomes of the mass of buyers and hence promote capacity operations; to discussion of the relations between cost and prices; to examination of market responses to price reduction and to various methods of sales promotion; and to consideration of influences on the price-maker of custom, bankers, and trade associations. The next section surveys the general changes in the structure of industry, market patterns, and competitive forces, and treats group solidarity and Government participation in price-making. The authors' thesis is well summarized in the final chapter. Throughout the book it is suggested vigorously to the executive that an understanding of the concrete manifestations in his own business of the matters here discussed will lead him to eschew restrictionist types of sales promotion, accounting procedure, and pricing, and to shake off such pressures from trade associations or bankers as hamper the aggressive prosecution of low-price policies.

To economists and others interested in public policy this book is important because it contains a sharp challenge to those views of the problems of big business which emphasize the ineffectiveness of competitive forces and the wastes of monopoly; and because it implies a denial of the present desirability of more Government control in industrial markets or of change in the antitrust laws. The authors evidently believe that problems of monopoly first need more attention from business executives.

Their position is not, however, entirely clear. They argue that in the last quarter century growth in the number of large firms operating in a common market and the aggressive application of industrial science in widening the range of substitutes have made competition keener and more effective in stimulating progressive advances and in carrying their benefits to consumers. How pervasive such competitive forces have become is not disclosed, for quantitative study of the question is not attempted. That the authors be-

lieve there are many markets in which monopolistic policies have not yet been replaced by this "dynamic price-making" is attested by their energetic endeavor to convince business men that enhanced progressiveness and price reductions will ordinarily yield more profits in the long run than restrictionist policies. But some doubts as to the general truth of this proposition are evidenced by their failure to state it explicitly and by their pains to stress the social responsibilities of the corporate executive. The plain implication of all this is that if the plea of Messrs. Nourse and Drury—and of several business leaders whom they quote—goes largely unheeded, we shall find ourselves with just what we now have, serious monopoly problems.

The authors attack the customary practice of approaching these problems from some sort of equilibrium theory which they think misconceives the social problems involved through failure to emphasize the dynamic elements from which progress comes. To say that in launching an offensive they have neglected the solid merits in the hypotheses raised by the theory of monopolistic competition is not to detract from the force of their objection to this serious shortcoming. Although they have thrown a spotlight on neglected dynamic forces and have set up hypotheses which The Brookings Institution might well examine quantitatively, they have not developed an integrated set of principles, embodying the important dynamic elements, which can be used in practice to make the qualitative distinctions and the rough quantitative measurements necessary to distinguish socially desirable market situations and policies from the undesirable. It is to be hoped that they will next turn their efforts in this direction.

Two more points may be made. First, the authors appear to contend that if most companies achieved continuous progressive advance and lowered prices in step with costs there would be no important monopoly problems. This contention is highly questionable. Continuous reductions in price corresponding to reductions in cost are quite consistent with a very considerable amount of monopolistic restriction, evidenced in large profits, waste in sales expense, or idle capacity. The most perfect monopoly bent on maximum profits would lower price continuously with cost reductions, if elasticity of demand were greater than unity.

Finally, Messrs. Nourse and Drury evidently believe that the best way of realizing the immense potentialities of the modern economy is to invest the few executives of great corporations with large power over economic forces and education in simple economics. This advocacy of the concentration of power in the hands of economic rulers who are selected by a half-understood process, often hit-or-miss, and are accountable to the people in no effective way for misuse of power, echoes the hope of Berle and Means for a "neutral technocracy" of corporate executives balancing the interests of all groups, although directly responsible to nobody. To those who cherish the traditions of democratic liberalism this will seem despairful counsel.

DONALD H. WALLACE

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Balances of Payments 1936. Geneva: League of Nations, Economic Intelligence Service. New York: Columbia University Press. 1937. 236 pp. $1.50.

This is a collection of the balances of international payments of 36 countries, mostly for the calendar year 1936. The like symposium, for 1935, was reviewed in last December's issue of this JOURNAL by the present writer. That review noted the marked decline in the number of countries compiling balances of payments, as depression and militarism continued. It commended the ingenuity or conscientiousness of the compilers for The Netherlands, France, Canada, and Latvia—leaders, all, in constructive thinking in this field, nowadays. It discreetly skipped past the sad exhibits in the American section, methodologically speaking, and roundly censured the stereotyped methods of the United Kingdom compilers as well as the stereotyped presentation of the Britishers who edit for Geneva.

The Geneva editors seem different in the present volume. Their generalizations respecting movements of goods, services, loans, and gold in 1936 are especially scholarly. Their long section on "General Tendencies" is penetrating, vivid, lively.

Whatever complaint the reviewer might suggest, against the editing this year, touches only the statement (p. 8), "no attempts have been made to present the information for each country in accordance with the detailed standard form sent out to governments." Despite that statement, nearly every one of the 36 tables appears in standardized form. I still hold, from last year, that "the League would do better by reprinting the balance-of-payments tables of the various countries, just as they were originally presented—no individuality or local color lost." This would not interfere, of course, with the excellent "synoptical" tables constructed by the editors themselves. In this field we may go far, yet, in improved presentation.

Still valid, I think, is my last year's criticism of the League editors' failure to signalize or salute new contributions to methodology. Consistently they seem to prefer product to process. At the present embryonic stage of this science, is it not less important to reprint, for example, the fantastically erroneous and misleading estimate of America's net movement of capital in 1927 (an *inflow* of $783 million) than to record processes later invented whereby such blunders can be avoided? Every advance in methodology made by any of the 36 compiling countries should be faithfully noted in a separate section by the editors.

Scientific method in balances of payments, as elsewhere, consists of collection, classification, and generalization. The collecting process in this field is fascinating and picturesque—if at times downright provoking. A seemingly water-tight stub becomes a leaky sieve whenever some agile-witted foreign compiler pops up with a brand-new invisible item overlooked by everybody. New, picturesque, or unusual invisible items of international trade, from the present volume, follow:

Australia—Upkeep of soldiers graves abroad; overseas mail subsidy.
Belgium—Seasonal workers.
Egypt—Annual pilgrimages to Mecca.
Germany—"Undefinable capital movement."
Hungary—Hire of railway wagons.
Iraq—Pension contributions to foreign officials.
Irish Free State—Net receipts from Hospital Sweepstakes.
Latvia—Payments of Latvian newspapers to foreign correspondents.
Netherlands—Government assistance to Dutch nationals abroad.
Norway—Whale oil sold from herding grounds.
Poland—Charges for loading and unloading ships.
Sweden—Lottery tickets.
Union of South Africa—Recruiting expenses for tropical natives in mining industry.
United Kingdom—Royalties for American sound-film apparatus.
Venezuela—Silver coin exported for reminting.

Two of the foregoing invisibles seem never to have been investigated by any American compiler. The Polish compiler raises the question of loading and unloading ships. The Latvian compiler opens up the whole field of news syndicates in international affairs. Both these new items may be "miniature invisibles" in the American table of payments—too small to record. Again, maybe not.

Note that these contributions to methodology came from smaller countries. Clearly the ability of compilers has little to do with the size of their countries. The Bulgarian and Greek compilers also win laurels—these for their handling of their "preliminary net discrepancy due to errors and omissions." By paradox, that net discrepancy is the one completely reliable figure in a balance of payments. With it and a table of maximum comparisons one can sometimes perform near-miracles in the localizing of errors.

The Bulgarian compiler (p. 72) threw his net discrepancy into his commodity trade, where he perhaps positively knew it originated. The Greek compiler (p. 125) put his preliminary net discrepancy into "yield of Greek investments abroad" in 1929–31 and into "unascertained foreign assistance" in 1933–34; in 1935–36 he let it stand. Several countries have long thrown all or part of their preliminary discrepancies into movement of capital, short-term or long-term: their least visible item. Obviously this solution makes sounder sense than the shadow-boxing of the compilers for Canada, Iraq, and Sweden in this volume; these declare that their capital-movement figures caused their discrepancies—and do nothing about it.

Under this topic of discrepancy fluctuations, the Soviet compilers are a breed apart. They report no discrepancies, preliminary or final, in their balances of payments. Their figures (p. 199) are compiled "from exact information concerning the foreign transactions, available in the bookkeeping departments of the Soviet economic organizations." Contraband is indulgently presumed not to exist.

The American section of the League symposium specially concerns readers of this Journal. The figures therein are those issued by the Commerce Department. This is unfortunate. General untrustworthiness of those figures was established about two years ago by the National Industrial Conference Board, in an investigation costing upward of $20,000 and extending some 16 months. The Board listed more than 50 arithmetical errors in the Department's 1931 Bulletin and just 122 in the 1932 Bulletin. The 1933 and 1934 Bulletins were found to be similarly honeycombed with errors, but no formal listing of them was made. Typed lists of the 1931 and 1932 errors were supplied at different times to the Department of Commerce, which has nevertheless continued (with the same compilers) to reprint, in its comparative tables, all or nearly all its original errors. Incidentally, those "comparative" tables have hardly any comparability at all, because of radical changes in estimating methods and in classifications.

The Board publication—"International Transactions," by the present reviewer and associates—devoted scores of pages to explaining corrections or necessary adjustments in the Department's figures. It contains a vastly improved comparable table for the period 1922–34: the only strictly comparable one for that span of years. Its adoption by the League of Nations, for those 13 years, is emphatically to be recommended, in place of the "official" figures. After all, our Government is not a League member; and the Geneva editors are under no duress to print our "official" figures, save perhaps for such recent years as have not yet been privately audited and reconstructed.

Ray Ovid Hall

Washington, D. C.

The World Crisis, by the Professors of the Graduate Institute of International Studies. Geneva, Switzerland. 1938. New York: Longmans, Green and Company. xii, 385 pp. 10/6 net.

This book celebrates the tenth anniversary of the founding of the Graduate Institute of International Studies at Geneva. It consists of a group of essays, one by each member of the staff, on phases of international relations within the sphere of the writers' special competence. Little attempt at organic unity is made. On the contrary it is expressly declared that the only link between the essays is the Institute itself. This is sufficient, however, to focus discussion on the struggle to effect the international organization of the world and to defend what has been achieved against the resurgent tide of aggressive nationalism.

Political and historical matters are treated severally by Professors Mantoux, Rappard, Bourquin, Ferrero, and Potter; legal problems by Professors Kelsen, Wehberg, Guggenheim, and Kaeckenbeeck; and economic questions by Professors von Mises, Röpke, Whitton, and Heilperin.

In the political, historical, and legal essays the League of Nations is the

central theme. Professor Kelsen argues for the separation of the covenant of the League from the peace treaties, and Professor Guggenheim discusses legal and political conflicts in the League as a preliminary to a consideration of whether, and how, it would be possible to develop the League into a community which would meet justifiable needs for change. Professor Mantoux, an insider, traces the fateful failure of the League powers to enforce League policy in the Polish-Lithuanian dispute of 1921, while the brighter episode of the Arbitral Tribunal of Upper Silesia is presented by the former President of that body, Professor Kaeckenbeeck. Professor Rappard contributes a judicious survey of the League's evolution as a whole and concludes that, with all its failures, it has established habits and attitudes so suitable to the needs of humanity as to insure its early resurrection if it should ever be dissolved.

The present crisis in international organization is carefully analyzed by Professor Potter, and the same service is performed by Professor Bourquin with respect to democracy at large.

Problems associated with war are treated by Professors Wehberg and Ferrero. The former deals with the somewhat neglected problem of civil war in international law and with the new issues now appearing in this field. Professor Ferrero makes a significant distinction between wars for limited ends and wars "retrospectively justified" with changing and ever wider aims. In the former, sacrifices are kept proportionate to the original aims, but, in the latter, the aims are progressively made proportionate to sacrifices already incurred. The fate of civilization is tied up with the choice between the two forms.

The necessity for a radical change of spirit in the political sphere as a condition of improved economic relations is prominent in all the economic essays. Professor Whitton, for instance, after proposing for the distribution of raw materials a code of fair practice, to be made effective through international legislation, states that economic and political disarmament are indissolubly tied together and that both must be brought about at one and the same time. The conclusion is impeccable but not very heartening, and it nullifies much of the essay. The struggle for raw materials is surely the consequence rather than the cause of a warlike attitude. So long as that attitude persists there can be no mutual interest in codes of fair practice and, if the attitude should be reversed, the codes would be all but superfluous. This is recognized by Professor von Mises who, in a review of the evils of economic autarchy and its weaknesses even from the point of view of its authors, roundly declares that what the world needs is not more conferences and conventions but a radical change of mentality.

Professor von Mises sees no hope in anything but a return to, and development of, the economic system which reached its apogee, thus far, in the third quarter of the nineteenth century, but Professor Röpke, in his essay on International Economics in a Changing World, is somewhat more compromising. This is not because he is less skeptical of the prospects of

planned economies but because he is more impressed by the strength of the forces which have produced them. Acutely conscious of the ills that affect, and the greater ills that threaten, this troubled world, his thoughtful paper is a little disappointing in that it stops short with a prescription of "constructive liberalism," with little indication of what the specific content of that phrase might be.

Professor Heilperin's concluding essay on monetary internationalism is a well-developed argument from what the reviewer believes to be an untenable assumption. The assumption is that absolute stability of exchange rates is essential to satisfactory commercial and financial relations of an international character. This dubious hypothesis forces Professor Heilperin to call for the sovereignty of international over conflicting national monetary policies. It is certainly no overstatement to say that this is the hard way to attain his end. If, instead of absolute stability of exchange rates, an attempt were made to adjust rates proportionately to shifts in the relative domestic purchasing powers of the several currencies it would be possible for any nation to pursue whatever internal monetary policy it judged appropriate to its interest without significant disturbance of international commercial and financial relations. This is not the place to argue the matter. It seems indisputable, however, that progress in international affairs is dependent upon the reconciliation, rather than the overriding, of legitimate national interests and that the national right to an independent monetary policy will not, and should not, be surrendered.

It is impossible within the space of a short review to do justice to all the writers of these essays, and to concentrate attention upon any one or two of them would be invidious to the others. Every one of the papers is a thoroughly competent exposé of the topic selected and, in spite of its lack of unity, the book is instructive and interesting from cover to cover.

FRANK D. GRAHAM

Princeton University

Our Trade with Britain, Bases for a Reciprocal Tariff Agreement, by Percy Wells Bidwell. New York: Council on Foreign Relations. 1938. x, 129 pp. $1.50.

Prior to the official negotiations for a reciprocal trade treaty between Great Britain and the United States, the Council on Foreign Relations had undertaken "a study of the trade and tariff policies of the United States and Great Britain to consider the pros and cons" of a possible treaty. The study was carried on under the general direction of a distinguished committee which invited Professor Bidwell to write the report. The author was left "entirely free to express his own opinions" and conclusions. His summation constitutes the small volume now being reviewed.

Professor Bidwell offers in five successive chapters an analysis of American and British commercial policies, together with their influence on the respective exports and imports of the two countries. This lays the basis for his

sixth and final chapter dealing with the "prospects of an Anglo-American trade agreement."

The author sees much that the two powers have in common, in spite of the fact that "historically England has stood for Free Trade and the United States for Protection." He points to the similar methods of applying import duties, the "common adherence to the principle of equality of treatment in their commercial relations with foreign countries" and the use of the most-favored-nation clause. He also foresees mutual benefits resulting from a reciprocal trade agreement which might prove "a landmark in economic history" and a positive benefit to world trade. He understands, as well, that trade revival constitutes a common problem.

Bidwell adduces statistics (19 tables in the text and 8 in the Appendix) to show that the United Kingdom was our best customer in 1937 and that, although we purchased an amount equalling but 6 per cent of her total exports, these latter paid high duties when imported into the United States. An analysis of the goods, moreover, shows that they are in part complementary and in part competitive. He also notes the fact that together with the United Kingdom we have dominated the trade of the British dominions although Japan has made some headway in recent years.

Referring to the revision of the American tariff in the treaties already made with 17 countries, the author believes it has "proceeded with great caution" and that "there has been no wholesale slashing of rates." He suggests that perhaps " 'nibbling' would best describe the process." Nevertheless, "the cumulative effect on the tariff system of the United States, and on that of other nations, may prove of great moment."

The study is a skillful presentation and consideration of the issues and concessions involved. It shows an understanding of the possible benefits to all concerned and the sacrifices that might have to be made. At the same time, it recognizes the organized opposition that such a treaty may face on both sides of the water and anticipates the part that the British dominions will play. The successful negotiation of the treaty will depend on the attitude of public opinion in both countries. Although not undertaking to state what British opinion might be, he believes that popular support will be forthcoming in the United States—"not so much on the careful calculation of economic advantage as on the strong hunch that in the present confused condition of the world, freer trade points toward peace." An excellent bibliography concludes the volume.

ASHER ISAACS

University of Pittsburgh

Japan in Transition, by Emil Lederer and Emy Lederer-Seidler. New Haven, Connecticut: Yale University Press. London: Humphrey Milford. Published for the New School for Social Research. 1938. xi, 260 pp. $3.00.

This book, though far from being written as a statistical study, will be of value to anyone interested in formative influences on modern civilization,

as it is primarily an analysis of how these forces direct modern Japan. Though based on a former German publication of the authors, the present work has been greatly revised, after a two-year residence of Professor and Mrs. Lederer in Japan. While teaching at Tokyo Imperial University, Professor Lederer came into direct contact with a Japan in transition about which he writes, thus making his comments all the more valuable.

The authors treat with varying degrees of success such divergent subjects as religion and mythology, the cultural background since 1600, the written script, and a very thought-provoking and interesting section, the force played in Japanese life by conventions with the resultant subjugation of the individual. Following an analysis of the State in both China and Japan, the theme shifts to foreign contacts, foreign policy and elements in economic development which have forced Japan's activities along specific lines. Industrialization followed closely behind the growth of "the army which represented the technological high-water mark" of the country.

> "Just as militarism reaches beyond itself into industry, so the technological system of industrialism has far-reaching implications for the social system. Here lies the heart of the problem of Westernization. It is not the machine in itself, as has often been supposed, but the social impact of the whole industrial system—especially the militaristic industrial system—which threatens Japanese culture" (p. 181).

Furthermore, it is pointed out that the success of the army against China and Russia vindicated the movement toward militaristic industrialism. Thus the Japanese have become more aggressive in China, which has increased in intensity since 1931 (p. 209) until things reached such a pass in the summer of 1937 that:

> "From the standpoint of China, everything except the lease of Liaotung, the treaties involving the South Manchurian Railway, and similar matters, was illegal and therefore the earlier situation should have been restored. From the standpoint of Japan, China was not an equal, since she is not a state, and the 'mission' of Japan in the Far East necessitated measures which could not be confined within the framework of treaties" (p. 215).

So a mere incident, receiving impetus from recent activities of Fascist states and an increasing national movement in China, developed into a real struggle. Various basic economic troubles, such as the low value of capital equipment, the high proportion of national income for state expenditures, the high percentage of tenant farmers on the one hand and scarcity of land on the other (pp. 229–33), have become intensified and result in pressure for industrialization which in turn "displays peculiar characteristics which result from poverty in natural resources and from the persistence of traditional modes of life and labor" (p. 236).

Possibly the first part of the work would have been stronger if the scope had been more restricted, for it is in the last section on economic problems that the authors are the most convincing, their arguments being well supported by figures. Some details do not appear to be historically accurate. Hachiman, the god of war, is erroneously identified with the Emperor Ojin

of the late fourth century A.D., not the third (p. 23). In spite of a policy of seclusion started in 1633, Japan was far from "completely cut off from the outside world" (p. 46) during the Tokugawa period; witness the continued Dutch commerce, the Russian encroachments during the nineteenth century, the various British and American vessels from the end of the eighteenth century, and the signing of the first treaty with America as early as 1854.

That "nothing new was absorbed even from China" during the same period (p. 64) is equally false for what of the *Rangakusha*, that courageous group of physicians led by Sugita Gempaku who studied Dutch learning, principally medicine, in the 18th century? "Even from China" the stereotyped philosophy of Chu Hsi was adopted as standard by the Tokugawa family, the teachings of Wang Yang Ming (1472–1529) were first interpreted and studied, and such a political emigre from the Ming Court in China as Chu Shun-Shui (1600–82) personally directed the compilation of "The History of Japan." Such misstatements as these naturally reduce the value of this section of the work particularly.

There is an apparent inaccuracy in the remark that the population remained stationary after 1720 and amounted to 26,000,000 in 1726 (p. 226). Dr. Yanagisawa, one of Japan's leading statisticians, states that in 1721 there was a non-warrior population alone of 26,065,423 and by 1852 that section of society had increased to 30,000,000.

In conclusion, however, it must be noted that the dramatic transition of Japan has been admirably treated and the problems have been not only approached in a masterful way but treated in a pleasing style.

HUGH BORTON

Columbia University

Commercial Relations between India and Japan, by C. N. Vakil and D. N. Maluste. New York: Longmans, Green and Company. 1937. Studies in Indian Economics, No. 12. xiii, 210 pp. $3.75.

Inasmuch as Mr. Vakil is a Professor of Economics in the University of Bombay and Mr. Maluste is a former University of Bombay student, one opens this book in expectation of finding an informed treatment of the subject. This early judgment is reinforced as the reader progresses from page to page. The first 87 pages deal with the phenomenal development of industry in Japan since the middle of the nineteenth century. The material is not new, but it is well selected and effectively presented. The extent to which Japan is deficient in basic raw materials and fuels, her dependence upon intensive agriculture and foreign trade, and the hazards of her economic position are clearly and effectively analyzed.

Pages 88 to 149 of the book trace in some detail the currents of trade between Japan and India during recent decades. In many lines of light manufactures, Japan is getting a larger and larger proportion of a shrinking

aggregate volume of Indian imports. These Japanese goods compete with developing Indian industries. On the other side of the transaction, Indian cotton growers depend upon the Japanese market to absorb about one half of their total raw cotton exports. These circumstances, together with a series of Indian tariffs aimed at Japanese goods during the nineteen twenties and early thirties and a retaliatory Japanese boycott aimed at Indian cotton in 1932, led to the Indo-Japanese Trade Agreement of 1934. This agreement is analyzed in pages 177 to 191, and the text of the agreement is reproduced in Appendices I and II.

One of the interesting features of the book is a frank recognition of the superior efficiency of Japanese workers as compared with Indian workers. Causes of Japanese efficiency and reasons for Japan's success in manufacturing are examined. The reader closes the book with an idea, indirectly acquired, to the effect that India's industrial development, although slower than that of Japan, rests upon a firmer foundation.

HUGH B. KILLOUGH

Brown University

Common-Stock Indexes 1871–1937, by Alfred Cowles 3rd and Associates. Bloomington, Indiana: Principia Press, Inc. Cowles Commission Monographs, Number 3. 1938. xii, 499 pp. $6.00.

This volume contains the results of a statistical investigation conducted on an heroic scale. Fifty of the 500 pages are devoted to a discussion of the purposes, methods, and principal results of the inquiry; another dozen pages contain charts depicting certain of the indexes developed; the remainder of the book comprises the indexes themselves. The basic data employed are the prices, earnings, and dividend payments of all industrial and utility common stocks, and about 93 per cent of the market value of all railroad common stocks traded on the New York Stock Exchange in the period 1871–1937. The end-product is seven indexes computed for each of 59 groups of securities, classified by industry, and for 10 combinations of the individual groups, or 483 indexes in all. Three of the indexes are on a monthly basis and four on an annual basis.

Anyone who has ever attempted to investigate the actual behavior marketwise of common stocks or to trace the history of funds invested in common stocks will appreciate the difficulties this inquiry has overcome and the great amount of labor required for its completion. In making this study the authors have been faced with an exceedingly long series of questions having to do with both policy and technique. What should be the precise goal of the investigation, and in exactly what form should the results be presented? In what manner and in what groups should the stocks be classified? How should corrections be made for stock split-ups, dividends, and the sale of rights? How should those stocks be treated whose quotations

either are discontinuous or disappear entirely? What, if any, allowance should be made for intercorporate stockholdings? The solutions found for these and other problems on the whole are satisfactory. Certain of the assumptions the authors have made in developing their procedures can, in some respects, be questioned, and certain of their decisions may seem a little arbitrary. But the postulates of any investigation of this sort, from the nature of the case, must be bold; and the critic of the authors' scheme must assume the burden of indicating a better course.

The seven indexes compiled are for stock prices excluding cash dividends, stock prices including cash dividends, yield expectations (the prevailing dividend rate multiplied by the number of shares outstanding shown as a percentage of total stock values), yields, dividend payments, earnings-price ratios, and earnings. The methods by which the indexes have been put together are carefully explained in the text. The indexes have been computed for such groups of securities as: automobile tires and rubber goods, beverages leather, and lead and zinc. Only nine of the categories extend over the whole period 1871–1937; but the profile of Chart I, showing the date at which each index begins, affords an interesting bird's-eye view of the growth of American industry during the past 60 years.

A few of the groups of stocks appear to be catchalls for securities difficult to assign to other categories, rather than classifications with a clearly defined nature, and consequently the indexes computed for them seem of doubtful value. The miscellaneous service classification, for instance, contains, among others, the stocks of the Adams Express Company, the Commercial Credit Company, the American Pneumatic Company, the New York Dock Company, the Chicago Yellow Cab Company, and the General Outdoor Advertising Company. The finding that this classification was the most profitable for investors during the entire period 1871–1937 seems of little significance.

The section dealing with the relationship of corporate earnings reinvested —found to average annually 2.5 per cent of the value of corporate stocks in the 1871–1937 period—with the annual average rate of increase in the value of stocks—found to be 1.8 per cent—seems to be one of the less happy portions of the book. The discussion of this point apparently assumes that the discrepancy is sufficiently illogical to require an explanation—an assumption it would be difficult to defend—since a number of possible explanations are canvassed. None of the hypotheses offered, however, seem to recognize that if all the earnings of corporations had been paid out during this period, or even if a considerable portion of those retained had been disbursed, the course of stock prices would almost certainly have been radically different from what it was. The conclusion which the authors appear to favor, "that during the last 67 years common stocks in the United States have in general sold at about 72 per cent of their true value" as measured by the return to the investor, certainly seems open to grave suspicion.

Viewed as a whole, this volume is a valuable addition to the literature dealing with securities and security prices and will be of much assistance not only to the financial analyst but also to the economic historian and economic theorist.

CHARLES CORTEZ ABBOTT

Harvard University

Monetary Policies of the United States, 1932–1938, by James Daniel Paris, with a foreword by Benjamin Haggott Beckhart. New York: Columbia University Press. 1938. xv, 198 pp. $2.75.

In the foreword to this volume Professor Beckhart observes that in "detailing the monetary enactments and policies" and in the "evaluation of the results" the author "has furnished a *vade mecum* for all monetary students." This endorsement, in the parlance of bankers, provides two-name paper and enhances the marketability of the instrument. But the standing of the endorser—to pursue the analogy—does not relieve the reviewer from examining the maker's own commitments and the underlying transaction.

The text of the book consists of three main sections tracing the development of policy with respect to gold, silver, and note issue, respectively. The term "monetary policies" is thus applied narrowly, excluding, except for incidental mention, budgetary policy, banking policy, and foreign exchange developments. Approximately two-fifths of the book consists of chronologies and reprints of monetary laws and presidential messages bearing thereon.

Many monetary and non-monetary measures have contributed to the changing economic situation since 1932, and sharp differences of opinion have existed with respect to the efficacy of Government policy at these points. The author emphasizes the inconsistencies involved in a number of these measures, and his own conclusions and suggestions may be indicated briefly. He states that the "gold policies of the Administration have failed signally to reach the goals set up" (p. 108). He argues that "the President's power to change the dollar ought not to be extended when it expires" (p. 114) and that "the dollar ought permanently to be left at its present weight" (p. 114). He observes in connection with the silver policy that "none of the objectives sought was obtained" (p. 109) and that the Purchase Act should be repealed (p. 114). He approves of the retirement of the national bank notes and suggests that Federal reserve bank notes should "be buried once for all" (p. 111). He recommends that the "Glass-Steagall amendment relative to the Federal Reserve note should either be repealed or made permanent" (p. 114).

Probably the analysis of silver policy is most satisfactory. There are important aspects of the gold question which the author does not explore in reaching his conclusions, and there are grounds for disagreeing with the conclusion that we abandoned the *de facto* gold standard a second time in 1936

when we limited gold exports to stabilization fund transactions (pp. 36–37). The reviewer disagrees also with the banking theory which leads to the conclusion that "it is deplorable" that the Federal reserve note has ceased "to fluctuate with the ebbs and flows of business, as reflected in bills, acceptances and other available eligible paper" (p. 110). In arguing that there was little need for the Federal reserve bank note "even in an emergency," the author apparently overlooks the fact that the utilization of an asset currency has been a traditional method of coping with panics.

Dr. Paris has provided a detailed account of monetary developments which should be useful for reference purposes, but the "evaluation" is at some points incomplete and superficial.

LEONARD L. WATKINS

University of Michigan

Tax Relations among Governmental Units, by Roy Blough *et al.* New York: Tax Policy League, Inc. 1938. vi, 226 pp. $2.75.

In this timely book a number of the problems in the fiscal relationships of our 175,000 units of government are discussed in an interesting and able manner. It consists of 16 papers that were presented at the annual meeting of the Tax Policy League in 1937. The general topics treated include Federal and state relations in the field of taxation, Federal and state aid, and state control of local finance. The book is a welcome addition to the literature of public finance at a time when the complexities of American taxation are a source of serious concern and the problems of taxation are daily becoming more acute.

The symposium reveals some of the difficulties that arise in an effort to secure a better coordinated system of taxation. Much talk has been devoted to the need for such coordination and the methods of securing it, but progress in the direction of a more harmonious system of taxation is realized only slowly. In dealing with these problems the Federal centralization of administration offers alluring possibilities of obtaining more consistent, simple, convenient, and equitable taxation, but the price is a loss of local democracy. Perhaps the conflicts, irritations, and inequalities in American taxation are not an unreasonable sacrifice to make for the preservation of a democratic form of government. It is to be hoped that Federal, state, and local governments will find it possible to cooperate voluntarily in an effective program of coordinated fiscal relationships, without the necessity of centralizing all administration in the hands of the Federal Government. The deciding factor is likely to be the policy followed by the Federal Government in taxation and other fields, since the state and local governments are largely at its mercy. The reader who attempts to secure a better understanding of these problems will find these papers thought-provoking and constructive.

ALFRED G. BUEHLER

University of Vermont

The Call Feature in Municipal Bonds, by the Committee on Municipal Debt Administration. Chicago, Illinois: Municipal Finance Officers' Association of the United States and Canada. 1938. ix, 118 pp. $1.50.

This book presents a thoroughgoing study of the subject of the call feature as related to municipal bonds. Attention is directed to the fact that the call feature has been used much less widely in municipal bonds than in private corporate bonds. This fact is only partly explained by the larger proportion of serial issues among municipal bonds than among corporate bonds. It is a pity that this book could not have been placed in the hands of municipal finance officers 20 years ago. In the present period of low interest rates those municipalities having outstanding bond issues with a call provision have been able to effect substantial savings in their debt service by exercising the option of redemption and refunding the debt at lower rates. A great number of municipalities have awakened sadly to find that the lack of a call feature in high coupon bonds issued in the 1920's precludes the possibility of refunding at rates representing savings of from one-fourth to one-half of the old coupon rate.

From the investor's point of view optional bonds generally are less satisfactory than noncallable issues, but the experience with corporate issues clearly shows that investors will buy optional bonds when the issue is properly set up. The recommendations of The Committee on Municipal Debt Administration of the Municipal Finance Officers' Association for the increased use of the call feature take into account primarily the interest of the issuing municipality but to some extent also the interest of the investor. The present period of low interest rates appears to afford less opportunity for issuing callable bonds on which later refundings at a saving are likely to be made than would be the case with issues in a period of high interest rates, but one cannot be certain that the low rates of the present day may not be further reduced if the existing monetary policy is long continued. The possibilities of the call feature in municipal bonds deserve a wider and more intelligent consideration than they have had heretofore. This little book makes a valuable contribution in that direction.

CARROLL D. SIMMONS

The University of Texas

The Economics of Corporate Saving, by J. Ellwood Amos. Urbana, Illinois: University of Illinois Press. Illinois Studies in the Social Sciences, Vol. XXII, No. 2. 1937. 136 pp. $1.50.

The scanty attention which the theory and actuality of new-capital saving by corporations had received before 1936 was embarrassingly revealed by the discussion during that year of the President's undistributed surplus tax proposal. The chief aim of this short book is to point out the existing inadequacy of theory as well as statistical raw material for thorough

analysis of the phenomenon. Economists have been painfully aware of the lack, evidenced by the inability of their colleagues either to marshal or to analyze arguments concerning the tax proposal, *pro* or *con*.

On the other hand, the special subject of corporation finance has long been aware of the importance of corporate saving; but in only a special sense—as a source of new capital for a growing enterprise. The author turns to standard treatises in this field for much of his very scanty analysis of the motivation or "theory" of corporate saving. The reader looks in vain for expansion of the analysis much beyond the borders set by writers on corporation finance. The effects upon capital allocation in society, the responses of corporate saving to various stimuli, the institutional influences upon it, and the changes in such saving in various phases of the cycle—all these are points of theory which are only suggested.

Searching for usable statistics, the author found an amazing inadequacy and confusion in the studies made by individual investigators (Friday, Knauth, et al), and by such groups as the Brookings Institution and the National Bureau of Economic Research. Treasury statistics he finds freighted with inseparable waste products in such a way as to defy exact reduction into usable figures. Not even proper estimates of the new capital needed for replacement as distinguished from new instruments of production can be made. Much of the first half of the book is concerned with surveying this unsatisfactory material. Some effort is made to analyze the sources of saving by groups and types of corporations, for which the author uses Government data.

An adequate though not vigorous summary of arguments (on both sides) concerning the undistributed profits tax occupies about one-fourth of the study.

SHAW LIVERMORE

University of Buffalo

Wheat Studies of the Food Research Institute, Stanford University, California. "The World Wheat Situation, 1936–37, A Review of the Crop Year," by Joseph S. Davis. Volume XIV, Number 4. December, 1937. pp. 103–82. $1.25.

"Monetary Influences on Postwar Wheat Prices," by V. P. Timoshenko. Volume XIV, Number 7. April, 1938. pp. 263–318. $1.00.

"Price Effects of Canadian Wheat Marketing," by Holbrook Working. Volume XIV, Number 2. October, 1937, pp. 37–68. $1.00.

"Trends of Yield in Major Wheat Regions since 1885. Part I, General Considerations and Rising Trends," by M. K. Bennett. Volume XIV, Number 3. November, 1937. pp. 69–102. 75 cents.

"Trends of Yield in Major Wheat Regions since 1885. Part II, Irregular, Stable, and Declining Trends," by M. K. Bennett. Volume XIV, Number 6. March, 1938. pp. 223–61. 75 cents.

"World Wheat Acreage, Yields, and Climates." Volume XIII, Number 6. March, 1937. pp. 265–308. $1.25.

"Soviet Agricultural Reorganization and the Bread-Grain Situation." Volume XIII, Number 7. April, 1937. pp. 309–76. $1.00.

"The World Wheat Situation, 1936–37," opens with a brief summary of certain general economic and political developments which influenced considerably the factual situation in respect of wheat. During the year there was a civil war in Spain, a spirit of uncertainty and fear which was accompanied by widespread retention of national self-sufficiency policies, an abandonment of their former gold parities by the so-called "gold bloc" countries, a continuance of general business recovery, a decided increase in the volume of international trade together with some slight reduction in trading barriers, an outbreak of industrial strikes in the United States, and higher prices for farm products as a class.

In regard to supplies, emphasis is placed on the smallness of the 1936 crop and the reasons therefor. Low yields are shown to have more than offset the influence of large acreage sown. Yields per acre were in most cases below the average for the preceding 10 years, while the average yield of the four chief exporting countries was smaller in 1936 than in any of the preceding 17 years. Generally speaking, however, quality was good. On the demand side a factor of major importance was the large-scale use of wheat for feed in certain countries and especially in the United States. Under the heading of marketing it is shown that the disappearance of the surplus problems and the rise in price caused changes in Government policies. Less support was given to wheat farmers while consumers received more consideration. International trade in wheat and flour showed an increase for the first time in six years in 1936–37, the expansion being due mainly to more effective demand in the European importing countries. The expansion in international trade in commodities generally created an added demand for shipping and was mainly responsible for a striking rise in ocean freight rates. Between July, 1936, and July, 1937, the rate on the route from Australia to the United Kingdom rose 14 cents per bushel. Significant also was the fact that India exported considerable wheat for the first time in 10 years, while Egypt got into the net export ranks for the first time in more than 20 years.

The year was marked by a steady improvement in prices especially toward the year-end. Durum wheat, on account of extreme scarcity, became especially dear. The effect of price improvement was especially noticeable in the United States and Canada where aggregate farm returns were higher than for many years despite small crops.

The exhaustive study dealing with "Monetary Influences on Postwar Wheat Prices" is both enlightening and suggestive. Considerable ingenuity

is shown in evolving the study technique, while the conclusions reached are both numerous and quite definite. It is especially fortunate that the author decided to divide the postwar period into four parts and to treat developments in each of these separately. The analysis shows clearly not only the fact that monetary developments played an important part in determining the level of wheat prices but also the special kind and degree of influence exerted in this or that period. Those who have been accustomed to correlate changes in wheat prices with changes in the production of the commodity would do well to study this number carefully. The study surely suggests that those who would attempt wheat price stabilization measures must pay serious attention to possible changes of a monetary character.

Dr. Working's study on the "Price Effects of Canadian Wheat Marketing" should be most valuable to all who are interested in finding out the true meaning and economic significance of what is commonly called "orderly marketing." The conclusions reached are the result of studying "the changes in the relations between prices of Canadian wheats and of other wheats. The timing and rate of marketing affect these price relations much as they affect the absolute price, while most of the general price influences have little effect on price relations. The price effects of marketing are therefore more clearly observable in certain price relations than in the level of prices." The most significant conclusion reached is that variations in the rate of marketing have very little effect on the prices paid. The mere fact that seasonal variations in price may show a marked correspondence both in direction and extent with variations in the rate of marketing is held to be insufficient reason for assuming that the rate of marketing has a pronounced effect on price. While it is true that a price decline will accompany the marketing of a new crop, such a decline is more likely to be due to the fact that supplies have increased than to the rate at which such supplies are sent to market. This distinction between the fact that supply has changed and the rate at which supplies come to market is probably a very fundamental one. At the same time the relationship between rate of marketing and price given at the end of page 48 would indicate that the effect of an increase in supply is not altogether different from the effect of the rate at which marketing takes place. It is there stated that "the rate of farm marketing may be supposed a significant price influence only while daily deliveries are running *fairly large.*"

In the study of yield trends (Numbers 3 and 6, Volume XIV) the world wheat area is divided into 14 regions. Of these, six are in North America, five in Europe and Northern Africa, one in Asia, and two in the Southern Hemisphere. In studying the yield trend in each of these regions it is recognized that many things may exert an influence on yield. The various influences are grouped into six classes. Where the regional yield has tended to increase, it is found to be due mainly to the development and use of new varieties and improvement in agricultural technique. Where yields have tended to decline, the main causal factor has been a shift from higher to

lower yielding areas. Such shifting has been possible mainly in the newer or more recently developed areas. In the older areas where settlement of the poorer as well as the better areas had taken place prior to the period being studied, the yield trend has been upward. One of the most valuable features of the study is the classification of the influences governing yield. While the results of the study do tend to show the relative strengths of the six types of influences under conditions as they have existed since 1885, it seems clear that the chief difficulty in forecasting future yield trends lies in the difficulty of predicting what changes may occur in the influences themselves.

For several reasons the appearance of a thoroughgoing analysis and evaluation of post-1930 developments in the agriculture of Russia is most welcome. Russian experience should have much to teach to those interested in selecting the optimum size of farm operating unit together with the type of business organization best fitted to own and control it. Moreover, Russia's actual and prospective ability to produce and export agricultural commodities is a matter of constant international interest and concern.

While the study is full of interesting information, special attention will be given the statement to the effect that yields per acre under collectivized methods have still to surpass those obtained on peasant farms prior to collectivization. Significant also, however, is the evidence of positive if gradual improvement in the matter of yields. Despite marked progress in the Government's ability to control collection and therefore exportation of grain, the prediction is made that Russian wheat exports are not likely to assume large proportions for several years at least.

W. M. Drummond

Ontario Agricultural College

Wheat Studies of the Food Research Institute, Stanford University, California.

"World Wheat Survey and Outlook May 1937." Volume XIII, Number 8. May, 1937. pp. 377–406. 60 cents.

"World Wheat Survey and Outlook September 1937," by Helen C. Farnsworth and Holbrook Working. Volume XIV, Number 1. September, 1937. pp. 1–36. 60 cents.

"World Wheat Survey and Outlook January 1938," by Helen C. Farnsworth and Holbrook Working. Volume XIV, Number 5. January, 1938. pp. 183–221. 60 cents.

"World Wheat Survey and Outlook May 1938," by Helen C. Farnsworth and Holbrook Working. Volume XIV, Number 8. May, 1938. pp. 319–58. 60 cents.

Through mid-May, 1937, wheat exports were the heaviest in several years, notably from Argentina, stimulated by the high price level and favourable price spreads. Active purchasing by Italy, Germany, and Spain was responsible.

During May-September, 1937, the important development was the near failure of the Canadian spring-wheat crop which forced prices up. They fell later to a greater degree in Chicago than in Liverpool and Winnipeg. Despite the poor Canadian crop, total supplies were not expected to be much above last year, owing to lower world stocks of old crop wheat. World wheat price movements, September-January, were large yet differed widely in different markets. The authors point out that the large wheat price had uncommonly little connection with developments in the wheat situation itself. The wide divergence in price levels of different markets seemed due to sharp increases and decreases in ocean freights and premiums on different wheats, principally Canadian and Argentine over United States winters and vice versa. As the price spread varied, the influence of freight rates varied. For instance the Chicago-Liverpool spread narrowed rapidly from early November to late December yet without curtailing export sales from the United States because ocean rates declined 6 cents per bushel and premiums of United States winters advanced over the Liverpool future of Canadian and Argentine wheats during the same period.

With the moderate surplus in world wheat supplies chiefly in the United States, it was expected that Chicago might dominate prices in world markets. There was little change in estimates of wheat supplies, international trade, or 1938 carryovers. The increasing evidence of economic depression in the United States and international political developments coupled with prospects for increased wheat supplies in 1938–39 have initiated, in the United States markets, declines in world prices. World net exports were forecast at 535 million bushels for 1938 with year-end stocks 1938 about 100 million bushels over 1937 largely attributable to United States carryover of about 190 million bushels.

C. W. RILEY

Ontario Agricultural College

Mortality Trends in the State of Minnesota, by Calvin F. Schmid. Minneapolis, Minnesota. The University of Minnesota Press. August, 1937. ix, 325 pp. $3.50.

Since Hermann M. Biggs wrote, "within natural limitations, any community can determine its own death rate," quantitative studies of community mortality data have aided greatly in the advancement of public health work. In this volume Calvin F. Schmid reviews the more important statistical data regarding mortality in the state of Minnesota for the past quarter century (1910–35). Individuals who are either engaged or actively concerned with public health will be interested in the contents. Public health workers, in Minnesota especially, will find the monograph of value in their daily activities and current procedures.

This type of material presents a difficult problem in arrangement. The sequence which the author has adopted undoubtedly will be acceptable to

almost everyone. From a discussion of the total death rate and the rate for certain causes over the 26-year period, 1910–35, he passes to a presentation of the principal causes of death in the biennial period 1932 and 1933. He next turns to mortality rates specific for age and sex, especially considering them as they are related to time and such other variables as: race, marital status, and certain specific causes of death. Following this, he introduces a discussion of infant and maternal mortality and seasonal variations in death rates. After a general presentation of comparative mortality in the registration area of the United States, the monograph closes with a consideration of the mortality in the twin cities, Minneapolis and St. Paul.

A volume could be written on any one of the above subjects. In presenting this monograph of limited scope the author hopes, however, that "this study may serve as an orientation for a series of more detailed investigations of mortality in the state of Minnesota." The selection of the important data for publication was undoubtedly difficult. It is to be noted that material of a more technical nature has been omitted. Many well constructed graphs delineated by the author are included. Because of limitation in space, the basic tables have not been published in many instances, the author feeling that "relative quantities can be grasped visually much more easily than is possible by means of mathematical or even verbal analysis." To anyone who is interested in more thorough study, the basic tables would be essential. Again, the standard population used in adjusting the changing age distribution of the population of Minnesota is given as a footnote, and no mention made of the method used in correction.

It will be found, however, that the appendix serves well in answering such criticisms, by including brief discussions of population changes, meteorological conditions and residence allocation, together with supplementary statistical tables. Allowing for the limitations stated above, however, the material is ably presented. Footnotes throughout the text and an extensive bibliography are important portions of the book, for they refer to more detailed discussions of the principal issues raised. Mention may be made also of the fact that the planograph method of reproduction was adopted for this publication. Graphic material, therefore, is faithfully delineated, and in general the text material is clear although the typing is not entirely uniform. On the whole the University of Minnesota Press may be credited with an entirely acceptable and thoroughly satisfactory publication.

EDWIN L. CROSBY

The Johns Hopkins University

Machine Politics: Chicago Model, by Harold F. Gosnell. Foreword by W. F. Ogburn. Chicago. The University of Chicago Press. Social Science Studies, Number XXXIII. 1937. xx, 229 pp. $2.50.

This short book is packed with more political *science* than is found in a dozen of the more "brilliant" literary tomes on its subject. One unique feature of the present study, as contrasted with a large number of works on

this favorite subject by novelists, journalists, and academicians, is that Professor Gosnell tells us *how he knows* what he tells us. He leaves his tracks through the political jungles of Chicago so clearly marked that anyone may see how he arrived at his conclusions. From the scientific point of view, this must be hailed as a notable characteristic for a book on the political machine. For writers on this topic have hitherto relied chiefly on display of vocabulary, vigorous declamation, and irresponsible journalistic impressionism. The present work describes and analyzes actual political behavior. As was to be expected, some of the political lore which has been elevated to the dignity of science by frequent repetition requires considerable qualification in the light of Mr. Gosnell's findings. But more important than these findings in this particular case is the demonstration of methods by which valid answers to political questions can be found.

The depression resulted in a substitution of Democrats for Republicans in the Chicago machine but did not seriously affect the main pattern. Indeed, in the absence of a somewhat fundamental social reorganization it is difficult to see how a community could get along without its political machine. For this informal, nonlegal, and perhaps in parts even illegal social structure has arisen to fill needs for which the formally established political structure has failed to provide in a form which the citizen recognizes as adequate. The machine, therefore, is an entirely natural institutional growth which renders services that large numbers of citizens deeply appreciate. A glance at Chapter IV, "Activities of Precinct Captains," will provide ample specifications of what these services are. When accredited social workers take over these functions and perform them to the satisfaction of their clientele, the machine may disappear. Until then there is no reason to expect it to go out of business, or to change except in its adaptations to changing conditions as described by Mr. Gosnell. "As compared with his 1928 predecessor, the 1936 precinct committeeman in the city of Chicago was less of an employment broker, less of a tax-fixer, less of a traffic-slip-adjuster, but more of a go-between for the relief agencies and the various branches of the federal government" (page 90).

The first four chapters give an illuminating and very readable account of the personalities and characteristics of the politicians whose activities constitute the workings of a metropolitan political machine. Succeeding chapters are devoted to statistical analysis of voting behavior on various types of issues and the relation of the press to voting. Of special interest to the statistician in this connection is the use of multiple correlation and factorial analysis to unscramble the actual interrelationship among the various influences that operate in a given political result. The intercorrelation of twenty-three variables in this connection indicates a type of analysis upon which the social sciences must rely to an increasing degree. Three statistical appendices, a bibliography, and an index complete this excellent monograph.

GEORGE A. LUNDBERG

Bennington College

Data on the Growth of Public School Children (from the Materials of the Harvard Growth Study), by Walter F. Dearborn, John W. M. Rothney, and Frank K. Shuttleworth. Washington, D. C.: National Research Council, Monographs of the Society for Research in Child Development. Volume III, No. 1 (Serial No. 14). 1938. 136 pp. $1.00.

It will be recalled that the Harvard Growth Study was initiated in 1922. The intention was to give physical, mental, and scholastic tests to approximately 3,500 children just entering the first grades of public schools in three cities in the vicinity of Boston, and to follow with similar measurements annually throughout the school careers of these same children. A longitudinal study covering 12 years has thus been made possible by the cooperation of The Commonwealth Fund, the Harvard Graduate School of Education, and the General Education Board of New York City. Clerical assistance was given also by the National Youth Administration and the Works Progress Administration. The present monograph gives the raw data for 747 boys and 806 girls selected for completeness of data and averaging more than 11 annual examinations each. Over 155 thousand physical measurements and over 33 thousand mental ages are here reported. Administrative and editorial procedures are given. An annotated bibliography of 75 titles gives the substance of "the most significant, published and unpublished studies which have been made with the materials of the Harvard Growth Study." Ninety-seven pages of finely printed material give for each of the 1,553 cases the following data: case number, sex, date of birth, ethnic stock, city, socio-economic status, and age of first menstruation of girls. For each of the repeated examinations the following data are given: chronological age, standing height, sternal height, sitting height, body weight, head width, head length, iliac diameter, chest depth, chest width, number of permanent erupted teeth, skeletal age, and mental age. No interpretation or discussion of data is given.

FLORENCE M. TEAGARDEN

University of Pittsburgh

A Handbook of Methods for the Study of Adolescent Children, by William Walter Greulich, Harry G. Day, Sander E. Lachman, John B. Wolfe, and Frank K. Shuttleworth. Washington, D. C.: National Research Council, Monographs of the Society for Research in Child Development. Volume III, No. 2 (Serial No. 15). 1938. xvii, 406 pp. $2.25.

The introduction to the monograph states that it has been prepared to serve as "a methodological aid for students of child growth and development and for others who are concerned with the diagnosis, treatment, guidance and education of children." The five authors had been given appointments as Fellows in Child Study by the General Education Board and worked at Yale University in connection with the School of Medicine and the Institute of Human Relations.

Part I, consisting of 70 pages, 10 tables, and 29 figures, deals with Anthropometry and was prepared by Dr. Greulich. Methods and tools of measurement are listed and discussed for each of the following sub-topics: anthropometry, skeletal development, skin and associated structures, and genital changes (male and female) associated with puberty. The literature on each topic is reviewed, and bibliographies are given.

Part II has to do with Biochemical and Physiological Aspects and was prepared by Dr. Day. The skin and associated structures, blood, respiration and energy metabolism, digestive organs and functions, and urine and feces are discussed. Techniques for measurement and examination are likewise discussed. The literature in each field is considered, and references are listed. One hundred and eighty-one pages of the monograph are devoted to Part II.

Part III on Medical and Clinical Aspects is the work of Dr. Lachman. It is 28 pages in length and includes methodological and diagnostic techniques for the study of the skin and its appendages, dentition, circulation posture, and physical fitness tests. Here again the literature is reviewed and citations are given.

Part IV is the work of Dr. Wolfe and has to do with Psychological Aspects. The 108 pages contain discussion of methods of measurement and review of the literature in the fields of: behavioral aspects of the skin and its accessories, sensory phenomena, perception and imagination, motor performances, intelligence and educational achievement, special abilities, sexual behavior, and personal and social reactions.

Part V, consisting of 17 pages, is by Dr. Shuttleworth and is called "Problems Not Involving Direct Measurements of Children." Measurable aspects of the environment, influence of hereditary and environmental differences, and statistical considerations are discussed. The literature is reviewed on the first two topics.

The present reviewer finishes a careful perusal of this monograph with several distinct impressions. The first is that an enormous amount of painstaking work on the part of the authors has produced a very valuable handbook. Lawrence K. Frank, in the Introductory, says that the "handbook will become progressively obsolete and deficient with every forward step in scientific work." This is, of course, true. Certainly no such compilation has been available hitherto, however, and it is questionable how soon another such will appear. In the meantime it is to be hoped that the present authors, or others, may find the means for keeping the survey current and for publishing supplementary reports at appropriate intervals.

A second impression which emerges from a study of the monograph is a question about the appropriateness of the name, stressing as it does adolescent children. Obviously, many techniques of measurement such as, for example, those of skin temperature, blood volume, lung volume, chemical constituency of urine and feces, eruption of teeth, sensory phenomena, footprints, and introversion-extroversion do not belong exclusively to adolescence. That the authors have not felt they could limit their discussion to adolescence, witness the inclusion of such a topic as a "test for pregnancy based on the presence of an anterior-pituitary-like substance in the urine of

pregnant women." One is glad, of course, that discussion and review of the literature have not been confined to the years of adolescence. This being true, however, one might wish that the name had been changed and that the whole gamut of childhood through adolescence had been adequately incorporated in the study.

A third impression of the monograph is that it will be of unequal value to the various readers for whom it was prepared—students of child growth, those concerned with diagnosis, treatment, guidance, and education of children. Obviously the requirements of these different groups of individuals vary so widely that it would be impossible in one volume to include adequate methods of study for each field. Some idea of the unequal distribution of emphasis in the present monograph can be given by saying that Blood has 90 pages devoted to it; Urine and Feces, 41 pages; Intelligence and Educational Achievement, 15 pages; and Sexual Behavior, 7 pages.

The Table of Contents is quite detailed and indicates careful organization. Nevertheless, the vast amount of minutiae encompassed within the book would be much more accessible if there were an index.

FLORENCE M. TEAGARDEN

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The Adolescent Period, A Graphic and Pictorial Atlas, by Frank K. Shuttleworth. Washington, D. C.: National Research Council, Monographs of the Society for Research in Child Development. Volume III, No. 3 (Serial No. 16). 1938. v, 246 pp. $2.00.

"The volume is intended for all who are working with or studying children or youth." About 250 charts, graphs, figures, and pictures already available are reproduced, and an additional 200 or more (making 458 in all) are original drawings prepared for this monograph. "Each chart carries a brief explanation to insure that the bare facts are correctly understood, a citation of the original source, and, where it seems necessary, a few comments on the nature of the original data. No attempt, however, has been made to discuss the significance of the data or to develop their implications." The table of contents lists the following captions: introductory statistics; physical growth; physical development and differentiation; physiological functions; sexual maturation; health; intelligence; education; special abilities; plays, games, interests and attitudes; behavior maladjustments; occupational adjustments; sex adjustments; differential urban influences; major activities, age 10 to 24. Many of the charts and graphs extend considerably beyond adolescence in both directions, some reaching from birth through age 80, some from one year through 20 years, some from age six through 20, and so on. Thus is illustrated again the difficulty of separating out "the age of adolescence" for study. The mechanical setup is good, and most of the graphic representations can be easily read. The pages are not numbered, all reference being to numbered graphs or charts rather than to pages. There is, however, both an author index and a subject index.

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